Vol. XXV. Part 7.

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The Journal of the Department of Agriculture of Victoria, Australia.

July, 1927.

PRINCIPAL CONTENTS

Mineral Deficiency in Live Stock
Pollination of Fruit Trees
Potato Field Crop Competitions
Wheat Growing in the Mallee
Brown Rot of Peaches
Shot-hole of Apricots
Planting Out Vines
Subdividing and Fencing the Farm
Raising Tobacco Seedlings

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OF

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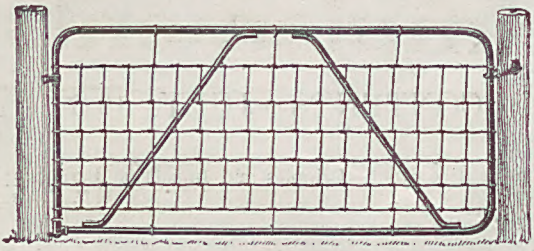

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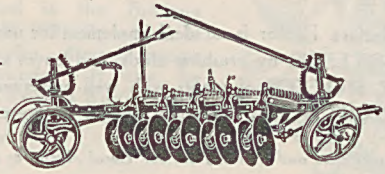

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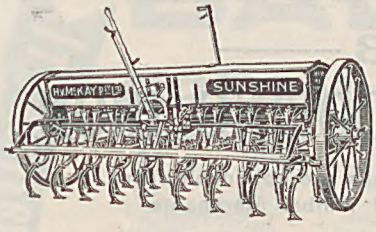

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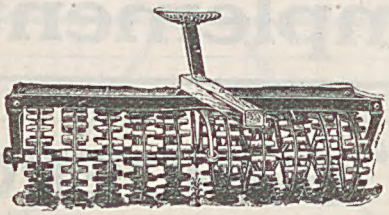

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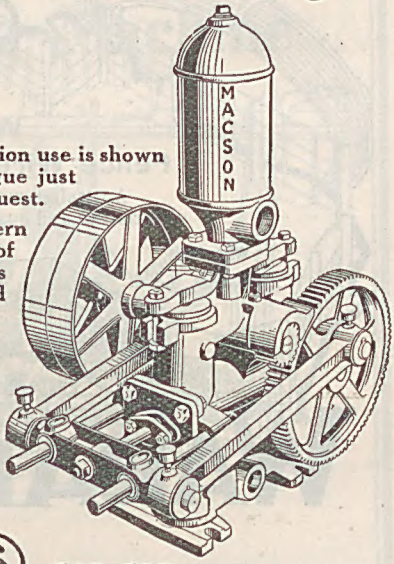

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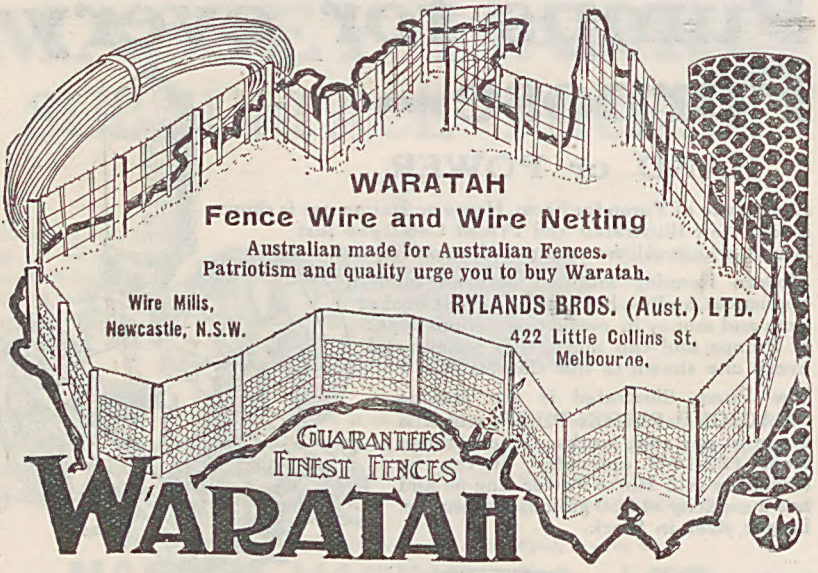

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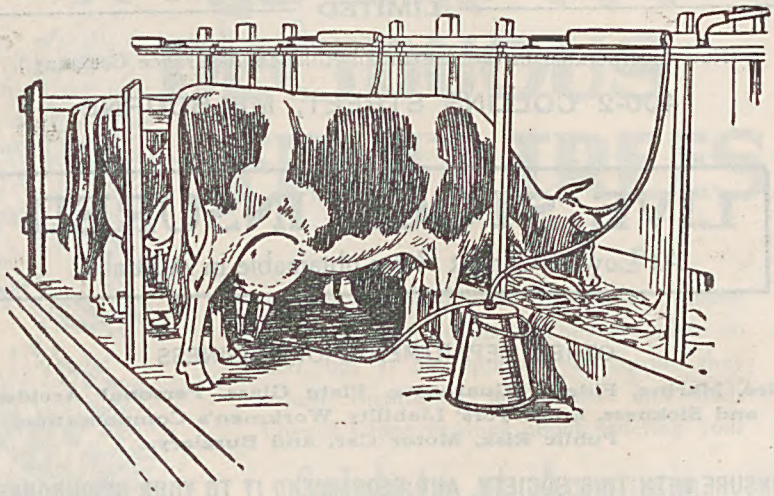

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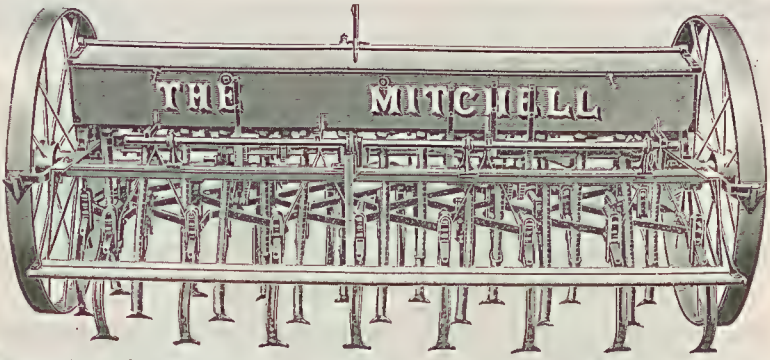

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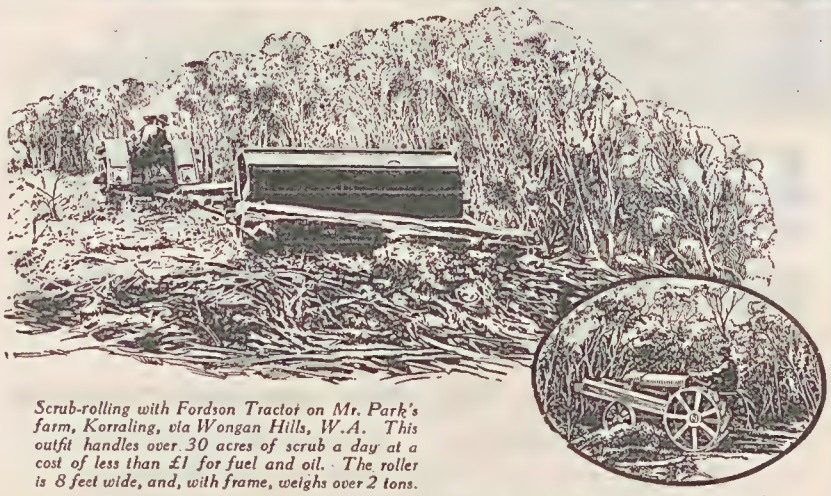

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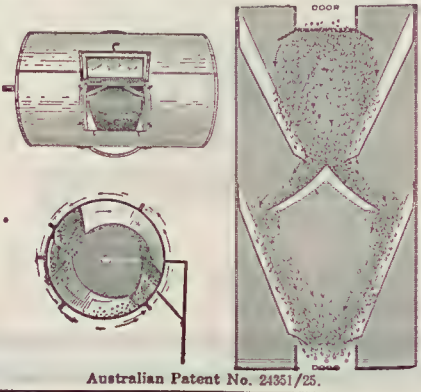

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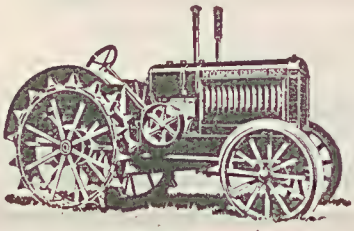

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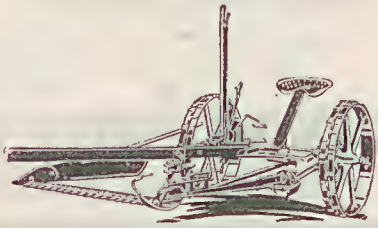

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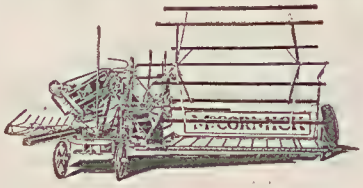

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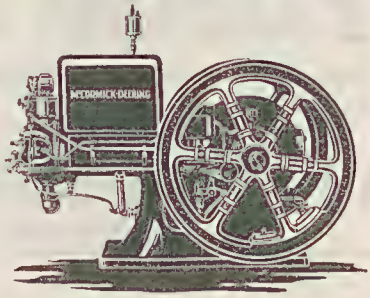

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MINERAL DEFICIENCY IN LIVE STOCK.

CRIPPLES AND IMPACTION PARALYSIS.

(*By R. J. de C. Talbot, B.V.Sc., Veterinary Officer.*)

There are few parts of the State where evidence of phosphorus deficiency cannot be seen among stock. The most noticeable and characteristic symptom of the more acute phase of the condition is the chewing of bones and other refuse by affected animals. This bone-chewing is simply an attempt by the animal to obtain that amount of calcium and phosphorus necessary for its normal development and maintenance. In its milder forms only, sun-bleached bones are eaten, but in the more aggravated forms putrifying bones, rotten carcasses, or other rubbish are taken.

Unfortunately, the majority of farmers do not look upon bone-chewing by cattle as anything likely to become serious. More often than not the practice is thought to be a freakish habit, and, in most cases, no attempt is made to remedy the condition which has induced the animal to become a bone-chewer. In fact, many consider it a normal habit of the beast, and, although they may have suffered heavy losses because of it, they have not realized that their animals were showing the usual symptoms of a lack of mineral nutriment. Yet phosphate deficiency is so serious that it is probably causing the loss of, say, millions sterling to Victoria each year.

The animal body requires various minerals for its normal development and maintenance. The most important of these are phosphorus and calcium, which are used mainly for building up the bony skeleton, and are required, therefore, in large quantities. They are excreted also in large amounts in milk, and for this reason lactating animals have need for an especially large amount of these minerals.

The only source an animal has for its mineral supply is its food, and the amount of mineral in this food depends upon that available in the soil in which the food is grown. In this connexion, the phosphates are of special importance to us on account of the low phosphatic content of Australian soils. It has been shown by analysis that Australian grasses have a much lower phosphatic content than those of

Europe, and that acclimatized European grasses grown in Australia have a lower phosphatic content than the same grasses grown in Europe.

This low phosphatic content of the soil is more pronounced in some of the older settled districts of the State, where grazing has been practised for many years. For the past 60 years, the average sheep population of Victoria has been 11,000,000, and the cattle population 1,400,000. The average number of stock slaughtered in Victoria for the past 60 years would be probably 3,000,000 sheep and 280,000 cattle annually. The average amount of phosphate in a sheep's carcass is 2½ lb., and in a cattle carcass 15 lb. Hence every year the total amount of phosphate removed from the farms by the animals slaughtered would be 5,223 tons. If we add the amount removed by pigs and rabbits, and also that required for milk, cream, and wool, the total amount probably would exceed 6,000 tons annually.

To be convinced that the soil in parts of the State is deficient in phosphates, one has only to see the remarkable results that have been achieved by top-dressing these soils with superphosphate. The pastures have been improved, and the carrying capacity, in many cases, more than doubled. In addition, when a comparison is made between the animals grazing on the top-dressed pastures with those under similar conditions on untreated soil, it is seen that the stock on the top-dressed land are in better condition, whether from the point of view of beef or milk production, than those on the untreated pasture.

Let us now consider in more detail the many conditions which result from keeping stock for any length of time on a diet deficient in phosphates.

Experiments conducted in various parts of the world have shown that animals fed on foods deficient in phosphates soon become abnormal, and exhibit weakness of the limbs and debility, whilst, if the diet is made normal again, the animals gradually recover. In many cases, under natural conditions, the only symptom noted by a casual observer is the bone-chewing habit, although, when careful observations are made, these bone-chewers are generally found to be unthrifty in appearance, and, if milking cows, they will be found to be yielding much below their full capacity.

These milder cases, as they may be called (although they are serious enough), are very common throughout the State. On a recent tour through the northern part of the country, during which I had occasion to visit many farms, I found that in practically every herd there were many animals which were known to be bone-chewers, and these were almost invariably in bad condition. In some portions of the State, and particularly the coastal districts, there are areas which have become notorious on account of the fact that, if animals are left grazing there for any length of time, they will contract a condition known as "cripples."

"Cripples" is what might be termed an acute phase of phosphorus starvation. The first symptom is that the animal appears unthrifty, the coat becomes rough, and the beast commences to fall away in condition. After a time the joints become stiff, walking appears to be painful, and, in some cases, the animal walks on the heels, so that the

hoof grows very long. Gradually the beast becomes thinner and weaker, swellings may appear at the joints, and the gait becomes stiffer and more stilty, until it almost seems that the animal is suffering from a paralysis of the hind legs. If no treatment is adopted, the beast will become so weak that it will lie down, and, being unable to rise, die of starvation.

All the animals so affected are confirmed bone-chewers; in fact, they will chew, not only bones, but offal of all kinds. Cripples is particularly common in parts of Gippsland, and in the south-western portion of the State.

There is another fatal disease in cattle which results directly from a mineral deficiency in the diet. This is known by different names in various parts of the world, but in Victoria it is commonly called impaction paralysis. Until quite recently very little was known as to the cause of this disease, except that it was recognized that, in some way, it was connected with the bone-chewing habit. Because of this, it was thought to be a very acute stage of phosphate starvation.

The disease is sudden in its onset. The beast suddenly becomes sick, the appetite is lost, and, if a milking cow, the milk flow ceases. Frequently the animal lies down, and appears to be affected with a paralysis of the hind legs. It makes repeated attempts to eat and drink, but is unable to swallow owing to a paralysis of the muscles of the throat. The tongue is often protruding with saliva running from the mouth. The disease usually runs a swift course, the animal rapidly becomes weaker, and death takes place in a few days, the end frequently being preceded by a period of intense excitement, during which the animal runs madly about, finally dropping dead. The disease is practically always fatal, as medical treatment, up to date, has been unsuccessful.

An investigation into the disease was conducted by Dr. Seddon, at the Melbourne University Veterinary School. He determined that it was due to a specific germ, which he called the bacillus *Para botulinus,* and he suggested that the disease be known as para botulism. It was demonstrated that the germ which causes the disease is found frequently on old bones and offal of all kinds, and that cattle chewing any matter so infected become affected with the disease. An anti-toxin was made, which was found to be fairly successful in effecting a cure. Up to date, however, it has not been used to any great extent.

Para botulism or Impaction Paralysis is common in many parts of the State, and the number of deaths occurring each year as a result of it must be very large, but so many cases are not reported, or never diagnosed, that it is impossible to form anything like a correct estimate of the number. The disease, although such a fatal one, is very easily prevented.

We have seen that only animals which chew bones or other foreign matter can become affected. Only those which are suffering from acute phosphate starvation will chew bones, so that if we can correct the mineral deficiency, we will prevent this disease. By correcting the mineral deficiency, we will prevent, not only Impaction Paralysis, but also "Cripples," and the many other phases of malnutrition which are so common in our State.

All this is possible by giving from 2 to 3 oz. of crushed bone meal daily to cattle in districts where bone-chewing is prevalent. Bone meal

is practically pure calcium phosphate—the mineral for which the bone-chewer is craving. The treatment is simple, and yet the results are remarkable. When bone-meal is given to animals suffering from "Cripples," immediate improvement is noted. The condition of the animal is improved all round, the coat becomes sleek, and, generally speaking, the animal is healthier and better able to make use of what food is available. In a short time, bone-chewing ceases.

There are many methods of administering bone-meal, but probably the best is to dose the animal daily with 2 to 3 oz. of the meal mixed into a thick paste with water. The objection to this method is the labour it entails, but it will be labour well rewarded. If the cows are being hand-fed, then the daily dose can be mixed with their feed. If these two methods are not practicable, the meal can be given in the form of a lick, and may be placed in boxes for the animals to take when they please. The objection to this method is that there is no certainty that the animals are receiving a sufficient quantity daily. In any case, several boxes should be made available to the stock, so that the weaker animals will not be crowded away from the lick. In some districts, the addition of salt to the bone-meal may be made, but the proportion should never be more than one of salt to two of bone-meal.

I would like to make reference here to some very illuminating experiments which were conducted in South Africa by Sir Arnold Theiles, Director of Veterinary Education and Research. In South Africa, cattle grazing on the veldt are particularly prone to become affected with various diseases due to phosphate deficiency. These diseases are very similar in many respects to those which we find in Victoria, so that the results obtained in these experiments are of great value to us.

In one of the many experiments conducted, two similar lots of cattle—50 in each—were taken. For both the average weight was 700 lb. per head. Both lots were confined exclusively to veldt grazing in a part of the country which was known to be deficient in phosphate, and on which the majority of the cattle remaining for any length of time became bone-chewers. Each beast of one of the two lots received 3 oz. of bone-meal every day, except Sunday; the beasts of the other lot received none. At the end of twelve months the average weight of those fed bone-meal was 900 lb., while that of the lot receiving no bone-meal was 800 lb. Actually, the difference in weight per head was 105 lb., and this extra weight, it is emphasized, was practically all extra butcher's carcass.

An experiment was then conducted with young cattle, and it was found that if the bone-meal feeding was commenced earlier in life the difference in live weight was still more pronounced, since growth as well as fattening is enhanced by the removal of the limiting factor of growth, which is always present when young stock are grazed in prosphorus deficient pasture. In this experiment, twenty young beasts were taken whose average weight was 650 lb. Ten of these were given 3 oz. of bone-meal daily, the others receiving none. In twelve months, it was found that the "no bone-meal" lot had increased to 800 lb., or by 21 per cent., while the "bone meal" lot had increased to 950 lb., or by 42 per cent.—twice as much as those receiving no bone-meal—and having a clear superiority of 138 lb. per head. The real extra profit of this gain

was given by an auctioneer's valuation, which showed an extra cash value of £3 per head in favour of the lot receiving bone-meal as against the actual expenditure of 6s. per head for bone-meal.

Although no experiments similar to these have been carried out in Victoria, there are hundreds of instances where beneficial results have been obtained by feeding bone-meal to stock.

So far these remarks have been confined mainly to cattle, but, from feeding experiments carried out with pigs, we know that the addition of bone-meal to the ration is attended with good results.

In regard to sheep, we have numerous experiments which have been conducted in connexion with the top-dressing of pastures. These have shown that by making up the deficiency of phosphate in the soil, we can increase the feeding value as well as the quantity of the herbage. The carrying capacity of the pastures has been increased, and the health of the sheep improved. These and other experiments have proved that both weight of carcass and fleece is improved by adding phosphates to the soil.

In conclusion, it may be said that the many disorders and disease in animals, due to mineral deficiency, are preventable either indirectly by the top-dressing of pastures with superphosphates, or, when this is not profitable, then directly by the feeding of bone-meal.

COWS AND BANKS.

It is reported that Clayton County is the only county in Iowa that has had no bank failure during the recent period of farm depression. It has nearly 30 banks, and all have weathered the financial storm.

According to the State Department of Agriculture, Clayton County leads in Iowa in the production of dairy products; its butter last year sold for more than $2,000,000. It has seventeen creameries, principally owned by farmers. This county, according to County Agent Combs, has nine cow-testing associations, and the tenth one is being organized. These associations directed the farmers' attention to the study of economical production and the desirability of eliminating "boarder" cows.

The results of Clayton County clearly indicate the stabilizing force of the dairy cow; her ability to bridge periods of depression in agriculture, to make diversification possible, to stimulate a better system of agriculture, and to stabilize all forces affecting the farm.

Merchants living in sections where the dairy cow predominates report good business and those coming from sections where little or no live stock is kept, report poor business.

These experiences in Iowa are nothing new to men who understand the cow and her relationship to an improved system of farming. Wisconsin, Northern Illinois, and Southern Minnesota all experienced a similar condition to that in which the Iowa corn farmer finds himself to-day, when the chief crop in these States was wheat.—*Hoard's Dairyman,* 10th May, 1926.

SUBDIVIDING AND FENCING THE FARM.

By H. C. Wilson, Manager, State Research Farm, Werribee.

As most farmers know, the subdivision of their property, if undertaken with judgment, will increase its value; further, proper subdivision plays a big part in the successful management of the farm.

Subdivisional fences are much more necessary to the man on the land who combines stock-keeping and agriculture than they are to the farmer who simply grows crops of grain or hay for the market, and who keeps only a few live stock. When, as is usual still, horses are used in the farm operations, grazing paddocks should be provided for them. This will reduce the chaff bill at certain periods of the year, and thus the cost of production of crops will be lowered. And it can be laid down as a definite rule that all farms (with the possible exception of those in the New Mallee) would be the better for being grazed.

The keeping of sheep or cattle in conjunction with crop growing makes considerable subdivision necessary.

Subdivision.

Dairy-farmers would be well advised to subdivide their holdings so that herds can be given changes of pasture; then the fed-down paddocks may be given time to sweeten and grow fresh pasture or forage. All stock thrive on an occasional change of pasture, and the carrying capacity of a farm can be considerably increased by this practice. With proper subdivision, fields can be set aside, and, if desired, pastures saved for times of scarcity.

Existing and possible future permanent and temporary water supply can be properly used, and, if necessary, conserved by subdivisional fencing. Ample water supply for stock is a problem confronting the stock-owner all over Australia to-day, for at every period of the year some districts of the Commonwealth are in the throes of a drought.

The quality of the land, the climate, the rainfall, the nature of the stock to be kept, and the present and probable future carrying capacity of the property are all factors that should be given careful consideration when subdivision is being planned.

Provision should be made for crops to be secured against stock; protection for existing shelter and proposed plantations must be thought of; suitable areas at the homestead for yards and small paddocks for the comfort of stock should be provided for; and the general aesthetic side of farm life must not be forgotten.

Existing obstacles should be avoided, approaches and outlets to the farm buildings should be considered, and, where necessary, land subject to floods should be fenced in such a way as will protect stock against disaster.

It is not always possible, nor is it advisable in the interests of farming economics, to subdivide a farm with the object of making the plan on paper look neat and regular. Where this can be done without detriment to easy and practical working it may be considered, but the best subdivisions are those that will give the greatest net cash

return from the property, even though some of the fields may be irregular in shape and look a little unsightly on paper.

Square fields where there are no obstacles give the greatest number of acres for the fencing erected, but rectangular paddocks often bring the farm land in close touch with the centre of operations and existing water supplies. Irregularly shaped paddocks are frequently necessary where farms have irregular boundaries and where obstacles are to be avoided, or where a water supply cannot be connected in any other way.

It may be opportune here to strike a note of caution when dealing with this subject, and warn the farmer and stock-owner who may be led to overdo the practice of subdivision that fencing to-day is expensive. Before beginning any subdivisional fencing, one should be convinced that the work will return a profit on the investment.

The capital cost of erecting suitable fencing to-day is heavy, and the upkeep of every additional chain is a serious item of expenditure, particularly after the first few years. Carrying capacity can be definitely increased by judicious subdivisions, but if the areas are too small the pastures may be unduly fouled by the stock, or the capital and upkeep costs of the fencing may eat up the profits made by the increased carrying capacity.

Too many changes are not advisable for certain classes of stock, such as ewes when lambing, or sheep that are kept for wool production, or any high-spirited animals when change is likely to make them discontented.

At the State Research Farm, Werribee, most of the subdivisional fences have been erected on the points of the compass. This has been possible partly because of the evenness and comparative flatness of the country, and partly because the water supply for stock could be arranged without additional expense.

The smallest fields are those near the farm buildings and on the heavy-stock carrying irrigation country, while the larger fields are to be found near the far boundaries of the farm, where dry farming is practised.

Farm buildings should be always erected on high well-drained land near a permanent water supply, and as near the centre of the farm as possible, with suitable approaches. This has been done at Werribee.

The Different Kinds of Fences.

There are many kinds of material that can be used successfully in the erection of suitable fencing. To-day, plain and barbed wire play an important part in new fences, particularly in districts where suitable timber is scarce.

The hedge of the Old World is not common in Australia, though evidence of this class of boundary or subdivision is still to be seen in the older-settled districts where rainfall and soils favour the growth of suitable hedge plants. Present labour costs for establishment and upkeep are factors that prevent extension of the practice to-day.

The log fence of the Australian pioneer settler in the timbered country is fast passing away as roads and railways are extended. Fencing wire is comparatively easy of transport, inexpensive to erect,

and is being used in the thickest of our bush country, where at one time timber alone was used.

Stone walls, which played such a big part in boundary and subdivisional fences in some of the Western District stony country, are seldom, if ever, built to-day, because of the high labour cost of the work. If these walls are rabbit proof, they are still of service, but those that have been built without regard to the shelter afforded to rabbits are gradually, but surely, being replaced by post and wire fencing.

The post and rail fence of the timbered country is still popular in certain districts where suitable timber can be split on the line. Even in country where timber is scarce, the post and rail fence is favoured for small yards in which horses or cattle are to be confined.

A good post and rail fence at Werribee to-day costs approximately £4 per chain for labour, transport, and material; this puts such fencing out of consideration, except where essential to the safety of the farm live stock. Such a fence would be 4 ft. 6 in. high to the top of the

Post and Rail Fence, fourteen years old.

posts, 4 ft. 2 in. high to the top of the top rail, and there would be three rails spaced from the ground evenly. The posts would be split from ironbark, redgum, or grey box, and would be 6 ft. 9 in. long by 9 inches by 4½ inches, 2 ft. 3 in. in ground, 4 ft. 6 in. out. The rails would be of messmate, 9 feet long, with a back of 2½ inches to 3 inches, and a face of 8 inches to 9 inches. The posts landed at Werribee cost approximately £12 per hundred, and the rails approximately £9 per hundred. The cost of erection would vary from 12s. to 15s. per chain; this means approximately £320 per mile; and, therefore, is a practicable proposition only where valuable stock are kept.

The most popular and economical fence to-day is that of posts and wire. Specifications for such a fence are varied. When in timbered country the use of fencing wire became common, the idea still held that fencing posts spaced from 8 to 9 feet apart were necessary to support the wires and hold the stock, but to-day less posts are being used, and fencing droppers are partly taking their place.

A very suitable fence for either boundary or subdivision, and one that is both sheep and cattle proof, can be erected with posts 22 feet apart supporting five or six plain No. 8 galvanized wires and one barb wire on top, with two split or sawn droppers between each post. Split droppers are favoured, as they are not broken easily by stock, or by teams used in the cultivating of the fenced fields. Such a fence, if intended to resist cattle and sheep, should be 4 feet high as a boundary, and 3 ft. 9 in. high as a subdivision.

The boundary fence would need six plain No. 8 wires and one barb, while the subdivisional fence could be erected with five plain No. 8 wires and one barb. The boundary fence should have the wires spaced as follows:—The first 6 inches from the ground, then wires 6, 6, 6, 7, 8, and 9 inches apart, giving a height of 4 feet. The wires of the subdivisional fence could be spaced as follows:—The first 6 inches from ground, then $6\frac{1}{2}$, $6\frac{1}{2}$, $7\frac{1}{2}$, $8\frac{1}{2}$, 10 inches, giving a height of 3 ft. 9 in.

Boundary Fence.

Three posts to the chain. Wire spacings 6 inches from ground, then 6, 6, 6, 7, 8, and 9 inches.

The posts should be 2 feet in the ground; they should be bored with a $\frac{1}{2}$-in. or a $\frac{5}{8}$-in. bit to measured spacings of wires. The plain wires should pass through the posts and droppers; the barb must be tied securely to the top of the posts and droppers with short lengths of No. 8 or 10 galvanized plain wire; a hole should be bored about 2 inches from the top of the post and droppers through which this fastening wire should be passed.

It is usual when building a fence of this kind to erect the posts first, and then bore them and the droppers to the gauge. The bottom plain wire should then be run through the first holes of the post and droppers, next the barb should be securely fastened, and then the balance of the wires placed in position.

Strains should be made at about every 7 chains; heavy straining posts are necessary only at the end of the fencing line, unless, of course, the fence is a long one, say, more than a mile.

The cost per mile of such a divisional fence at Werribee to-day is approximately as follows:—

	£	*s.*	*d.*
240 ironbark or grey box posts 5 ft. 9 in. long, 8 x 4, at £9 per 100	21	12	0
480 split droppers, messmate or bluegum, 3 ft. 6 in. long, 3 x 1¼, at £1 5s. per 100	6	0	0
17 cwt. of plain No. 8 galvanized wire, at £17 10s. per ton	14	0	0
7 cwt. of No. 12 barb wire, 2 ply, at £25 per ton	5	0	0
Two strainers and two struts	2	0	0
Labour of carting to line and erection—6s. per chain ..	24	0	0
Total	£72	12	0

A fence of the same class suitable for a boundary would cost approximately £7 extra, or approximately £80 per mile.

If, of course, the lines are short and extra straining posts and struts are necessary, or gates have to be erected, the cost would increase accordingly. Messmate posts are apparently suitable in the country where messmate grows, but at Werribee or similar country they are useless, as they decay in a few years and let the fence down.

Redgum, Murray pine, large Mallee, and many other trees yield posts suitable for fencing, particularly in districts where these timbers grow. Black No. 8 fencing can be used with success away from the coast in dry central or northern districts of the State, but at Werribee such wire oxidizes in a few years, and becomes useless.

Savings in cost of posts and erection in certain favoured districts may be possible; while, on the other hand, fencing may cost even more in places than it does at Werribee.

Iron fencing posts have their use in country subject to fires and where the ground is very stony, but they are not a success at Werribee, where teams and stock bend and twist them.

Concrete posts have also been successful in districts where timber is hard to obtain, and where the materials for the purpose are near at hand, but they are not gaining in popularity, mainly because of their cost. Where sand, gravel, and cement are hard to obtain, they are out of the question altogether.

Wire netting, if necessary in rabbit-infested districts, is best supported by posts placed 9 feet apart without droppers between the posts. The netting, if 3 ft. 6 in. high, should be placed in the ground at a depth of 4 inches. If posts are placed 22 feet apart with two droppers between, live stock will be much more likely to lift the netting from the ground, owing to the extra spring of the fence on the widely spaced posts.

Netting should be supported by three plain wires—one 2 inches from the ground, and the other two 18 inches apart. The fence should be approximately 3 ft. 10 in. in height, and capped with No. 12 barbed

wire. Such a fence costs at Werribee approximately £100 per mile, but in districts where good fencing posts can be obtained on the line and sinking is easy, it is possible to have the work done for £60 per mile.

Temporary Fences

Temporary fences should be erected only after due consideration, as the cost of the work is very heavy, and every time the fence is removed and re-erected a certain amount of damage is done to the material.

If, however, these temporary fences are necessary for protection to young plantations or for the purpose of feeding off forage crops, then one that can be quickly put up and taken down and one that is easy of transport should be considered. A fence of iron posts with Cyclone netting is quite suitable for this purpose, and has been used with success at the State Research Farm, Werribee.

In the Old World and in parts of New Zealand wooden hurdles 8 feet long by 3 ft. 9 in. high, made out of 3-in. by 1-in. sawn timber, are commonly used for feeding off heavy crops of rape, kale, turnips, or mangolds to sheep, but such a practice is still very uncommon in Australia.

Conclusion.

In conclusion, I would like to emphasize the fact that, whatever fencing is found necessary, the work should be first well planned, costs correctly assessed, and the probable returns likely to result from the work estimated. Then the work of erection should be done in a workmanlike manner that will be serviceable and last without repair for the greatest possible period.

TO INCREASE THE WHEAT YIELD.

It is becoming more clearly recognized that little advance can be expected in the maximum yield of wheat varieties, that marked increase of yields is not likely to result from any innate ability of new varieties to yield more than those of to-day. Increases will come on the one hand from better cultural methods, and on the other from the reduction of losses due to climatic factors and pests. The object of plant breeders to-day is not so much to produce more heavily-yielding wheats as to secure varieties capable of producing good crops of good quality grain under our average climatic conditions, and at the same time resistant to the diseases to which wheat is here liable.—*Journal of Agriculture*, W.A.

POTATO FIELD CROP COMPETITIONS, 1926-27.

Reports by the Judge, J. T. Ramsay, Potato Expert.

COLERAINE.

A gratifying feature of the competition this year was the increased number of entries over last year, and the evidence of increased interest in the competition. The standard of cultivation was very high, each competitor being awarded the maximum points in "cleanness," while all scored heavily for "evenness" of the crop. The heavy awards under these two headings can without doubt be credited in very large part to the experience of the previous season's competition, which was the first to be conducted in potato culture by the society.

The rainfall from November to the end of April, which can be termed "the effective period," because of the occurrence of severe frosts in sequence early in May (taking an average of the three stations, Winninburn, Tarranlea, and Strathallan) was only 5¼ inches, which is much below normal; yet in spite of this the exceptionally high average of all competitors of 11 tons 15 cwt. 3 qrs. per acre was obtained for the season.

Taking last year's average into consideration, there can be no doubt of the high suitability of the Coleraine country for potato production. At the present time only small individual areas are grown, but with the tremendous market handy in the Wimmera, and with Portland as a convenient shipping port for South Australia and Western Australia, there is no reason why the industry should not be extended considerably with benefit to the district.

The comparatively low current price of the land under consideration makes the potato-growing proposition all the more valuable.

The varieties submitted comprised only two, namely, Carman No. 3 and Snowflake; of these the Late Carman is undoubtedly the better table quality variety, and that it is at least equal, if not better than the Snowflake, in productive capability is proven by the figures obtained in this competition.

Stress must again be placed on the advisability of growers paying more attention to the spacing of the crop than has previously been done. The range of spacing between the rows in the crops submitted for examination varied from 24 to 34 to the chain, and in the case of some of the exhibits the spacing between the sets was as far apart as 2 feet. This is nothing short of waste of ground, and tends to the production of coarse textured, low-grade tubers. Close planting between the rows is most advisable if the maximum yield of medium sized, good quality tubers is to be obtained. This is amply evidenced by the figures submitted herewith.

Practically no disease of any consequence appeared in any of the crops examined. The only one in evidence at all was Rhizoctonia, which can easily be kept in subjection by choosing clean seed in the first place, and by dipping all seed prior to planting in a solution of formalin (1 lb. formalin to 30 gallons water) for 1½ hours.

In some cases no manure at all was used; in others as much as 6 cwt. per acre was applied. The majority of competitors were content

with a moderate application of about 3 cwt. It is significant that the winning crop, in spite of being on good rich country, was the heaviest manured. This variation of manuring amongst the growers in the district suggests the advisability of the establishment of experimental manurial plots, in order that the optimum dressing may be arrived at with some degree of accuracy. No doubt if application were made by the society, the supervision of such work would be undertaken by the Department of Agriculture.

One other point, attention to which would make for still further improvement, is the selection of seed from heavy-bearing plants. Opportunity was taken when judging to point out to growers the marked variation in prolificacy of individual plants, thus emphasizing the advisability of selecting seed from such plants only as give a reasonably good to heavy yield.

In order to foster continuity of interest in the competition, and therefore in the crop, it is considered advisable that, instead of giving a cash prize to the winning crop, a cup be provided which would be held by the winner for one year, but would not become the absolute property of any successful competitor until it had been won two or even three times in all, not necessarily in succession. This has already been done in the case of several other societies conducting these competitions, and has proved to be a considerable improvement over the cash prize.

Details of Awards—Coleraine.

Competitor.	Variety.	Rows per Chain.	Cleanness.	Evenness.	Quality.	Weight per Chain.		Points for Weight.	Total Points.	Weight per Acre.
						Large.	Small.			
Possible Points	.. ..	..	10	10	35	..	..	45	100	..
						lb.	lb.			T. C. Q.
A. G. Turnbull	Carman 3	34	10	9	31	120	4	45	95	18 4 0
P. McDonald ..	Snowflake	28	10	9	27	116	7	35	81	13 19 2
T. J. Fitzgerald	Snowflake	28	10	9	29	101	4	32	80	12 12 2
A. Bickley, sen.	Carman 3	28½	10	10	33	82	1	26	79	10 8 2
J. Mason ..	Snowflake	26	10	9	29	107	3	31	79	12 8 0
A. G. Turnbull	Snowflake	34	10	9	29	80	4	30	78	12 3 0
A. Wise ..	Snowflake	27	10	9	30	94	4	28	77	11 6 0
A. Bickley, jun.	Carman 3	26	10	9	31	82	1	24	74	9 10 1
C. Brown ..	Carman 3	24	10	9	32	76	1	21	72	8 3 3
A. Wise ..	Carman 3	27	10	8	31	75	4	22½	71½	9 0 3
J. A. Doyle B. Lyon J. Bunge	Withdrawn									

In allotting points for weight, the maximum 45 is given to the heaviest crop, and the others are allotted points for weight *pro rata*.

ROMSEY LATE CROP COMPETITION.

An outstanding feature of the crops submitted for examination in the Romsey competition was the very high standard of cultivation which had been given to them. In no instance did any competitor lose a single point under this heading. Such a condition is unique in my experience of judging crops in Victoria, and reflects great credit on those concerned.

Benefiting from the experience of last season, there was a general tendency on the part of exhibitors to adopt a closer system of planting than has been in vogue previously. This, no doubt, had a material influence on the weights produced per acre.

These, in spite of the adverse seasonal conditions (this season being one of the driest on record), gave, especially in the leading cases, very good yields indeed. The quality of the tubers produced was good throughout.

I would suggest that improvement could still be made by the application of a system of selection of seed, that is by selecting seed from heavy bearing plants of good type. This suggestion was forced upon me when noting the individual yields of the various plants taken out of the measured section, considerable variation being apparent at the time of digging.

The freeness of the crops from disease was a credit to the growers.

Keen interest was evidenced by growers participating in the competition, but the number of entrants, considering the importance of the district as a potato-producing centre, could be increased considerably with benefit to all concerned.

Details of Awards—Romsey.

Name of Grower.	Evenness.	Cleanness.	Quality.	Rows per Chain.	Weight per Chain.		Acre Tonnage.	Points for Weight.	Total Points.
					Large.	Small.			
Possible Points	**10**	**10**	**35**	..	..	..	..	**45**	**100**
					lb.	lb.	T. C. Q.		
P. J. Mitchell	10	10	33	30	44	1	5 17 3	45	98
Spring Bros.	10	9	33	32	41	3	5 17 0	44½	96½
McConnell Bros.	10	9	33	27	47	5	5 13 1	43½	95½
P. J. Sheehan	10	9	31	27	45	1	5 8 2	41½	91½
A. Vinnicombe	10	10	32	30	37	2	4 19 0	38	90
A. R. Wilson	10	8	32	32	26	5	3 14 0	28	78
A. Stammers	10	9	32	29	27	1	3 1 0	22	73
McConnell Bros.	10	8	30	28	23	6	2 17 2	21	69
N. B. Alston	10	9	30	26	17	2	1 19 0	15	64
Bowkett Bros. (withdrawn)									

DAYLESFORD.

Despite the dry nature of the season, some fair tonnages were recorded in the Daylesford competition—the highest being estimated at 6 tons 12 cwt. per acre. The quality of the tubers on the whole was very good, and the standard of cultivation given to most of the crops reflected credit on the exhibitors. There was absence of disease of any sort, with the exception of a slight affection of Rhizoctonia fungus (Collar Stem Rot), which can easily be controlled by dipping the seed, prior to planting, in a solution of formalin, 1 lb. to 30 gallons water, for 1½ hours.

A notable feature of the competition is the fact that easily the heaviest yield, and the winning crop, was the produce of seed which had been subjected to the boxed system of storage. This should act as an

incentive for other competitors to give this system a trial, if only on a small scale, in order to prove for themselves the advantages to be derived from its adoption.

Profiting on the experience of last season, the majority of competitors adopted fairly close planting between the rows, and this undoubtedly had an influence on producing better quality tubers, notwithstanding the fact that the seasonal conditions were adverse.

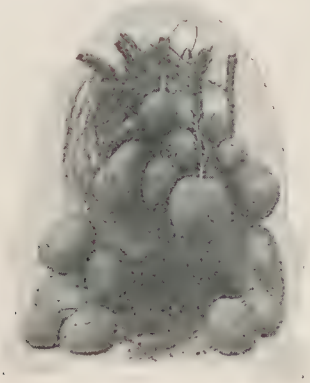
I would again draw attention to the importance of growers instituting a system of selection of seed, in order to improve the strain of the variety and the crop tonnage. At Millbrook, in the departmental demonstration plots there, with five varieties subjected to selection, as against non-selection of seed, a range of increase was obtained from 25 to 43 per cent., and averaged about 33 per cent. over the whole five varieties.

At Daylesford, too, the number of competitors should be greatly increased.

Details of Points—Daylesford.

Name of Grower.	Evenness.	Cleanness.	Quality.	Rows per Chain.	Weight per Chain.		Acre Tonnage.	Points for Weight.	Total Points.
					Large.	Small.			
Possible Points	**10**	**10**	**35**	..	..	..	..	**45**	**100**
					lb.	lb.	T. C. Q.		
Gooch Bros.	10	9	31	28	53	1	6 12 0	45	95
B. McKinnon	9	9	30	31	39	10	5 8 0	38½	86½
J. Rowe	9	10	33	31	33	1	4 11 0	31½	83½
M. Courtney	9	10	30	30	36	5	4 16 0	33½	82½
J. Rowe	9	10	33	31	27	4	3 14 0	25	77
Gooch Bros.	10	9	33	30	23	2	3 1 2	21	73
W. J. Stannage	10	10	32	31	17	4	2 7 0	17	69
W. J. Stannage	10	10	32	30	16	2	2 3 0	15	67
T. MacCormack	8	7	30	25	16	9	1 15 3	12	57

NOTE.—In allotting points for weight the maximum of 45 points was given to the heaviest crop and to the others *pro rata*.



RAISING TOBACCO SEEDLINGS.

PREPARATION OF SEEDS AND BEDS.

(By Temple A. J. Smith, Tobacco Expert.)

One of the most important factors in growing tobacco successfully lies in producing strong healthy plants, and too much care and attention cannot be given to this phase of tobacco culture. To have a plentiful supply at the proper time is the surest foundation for a good crop, and much subsequent labour in the filling in of plants that fail to strike, and coddling of weak plants will be saved in consequence. Strong plants will result in a 95 per cent. strike, or even better, while weak plants often fail to the extent of 50 per cent. This entails hand planting to replace the failures, and so creates much additional trouble and expense.

Selection of the site for seed-beds is important. A northerly aspect, so that the plants may get a maximum amount of sun, with shelter from the cold south winds, is advisable, and should result in the raising of early plants. All green trees within 50 feet of the beds should be cut down. Experienced growers agree that it is better to keep as far away from green timber as possible.

It is an advantage to protect the south and eastern sides by means of dry bush or any other material available. It is well always to have good drainage and to be within easy reach of running water, from which a supply can be taken readily when required to keep the soil moist in dry periods. Low ground where fog is liable to lie should be avoided. Late autumn is the best time to commence making seed beds, but beds can be made up to as late as October. The most suitable soil for the purpose is a rich sandy loam. A piece of virgin land is preferable.

It is an excellent plan to burn the surface of the site by piling brushwood upon it to a depth of 4 or 5 feet, and firing it in dry weather. This helps in destroying weed seeds and the larvae of insect pests. In addition, it provides a supply of potash, which is particularly beneficial. After burning, all rough material should be raked off and an application of well rotted manure applied. The land should be dug over to a depth of 3 or 4 inches, mixing the manure well with the soil. The soil should not be turned over so deeply as to bring up the subsoil.

In the early spring 150 to 200 lb. of market garden fertilizer should be applied to each 100 square yards of bed and worked well into the soil. After the land has been worked into a fine friable condition it should be marked off into beds 3 to 4 feet in width, flat on top and leaving a narrow path between. Some growers like the beds raised a few inches above the surrounding surface level so as to ensure good drainage.

There is a difference of opinion as to when the first seeding should take place. Many leading tobacco-growers now favour later sowing

than has been the case in the past when seed was sown in June and July. Late August or early September is about the right time to sow in Victoria.

It should not be necessary to warn growers that only the best seed should be used. All seed requires winnowing so that only the heaviest and cleanest is sown, with a consequent greater percentage of good plants. The amount of seed required and the treatment is so simple that no excuse remains for the neglect of this precaution. One heaped-up tablespoonful is sufficient to sow 100 square yards of bed. In order to spread the seed evenly it is necessary to mix it with dry sifted ashes, or sand at the rate of a tablespoonful of seed to 2 gallons of sand or ashes. The mixture is sown over the bed by hand, the sower going backward and forward at least twice to ensure an even seeding. It is not desirable to rake the seed in, as this buries it too deeply. After sowing, simply press it into the surface with a board until the soil is well firmed. It is essential that the soil be compacted, so that the moisture may be brought to the surface in close contact with the fine seed. A common mistake with new growers is to use too much seed. It is better to have the plants a little too thin than too thick in the beds. The aim should be to give each plant a square inch of room. Plants grown too thickly will be spindly and delicate, and will not strike as well as those given room to develop properly.

It is advisable to sow 100 square yards of bed for every 5 acres to be planted. To ensure a good supply, careful growers sow 100 yards of bed in August, another 100 yards in September, and still another in October. This is one reason why some growers succeed in getting a crop each year while others fail through neglecting to safeguard themselves in this respect.

After seeding, the beds should be watered. A fine rose should be placed on the watering pot or hose, so that the seed will not be washed off the beds. Water must be applied always to keep the beds moist (but not wet) until the plants are properly established, after which only sufficient water should be given to keep them growing. It is dangerous to chill the ground, as this causes liability to mould—the greatest bugbear of the tobacco grower.

When the beds have received their first watering they should be covered, to maintain as even a temperature as possible, and to keep away insect pests and the spores of disease. The best covering is cheese-cloth, which should be placed upon a framework of boards or logs, about 8 to 10 inches above the beds. It is not wise to use close hessian or bags, as these exclude light and air, and cause the plants to be delicate. The cover should be supported by wires to prevent its sagging and rubbing on the young plants. Many growers simply cover the young plants with straw or grass, which has not the same effect in preserving a warmer temperature, neither is it a good protection against insects or disease.

Watering can be done through the cheese-cloth in the early stages of growth, but when the plants have covered the ground the cover should be removed every fine day so as to harden them for transplanting. The cover should be replaced before the sun sets. Plants require hardening in this way for at least a month before they are ready for

transplanting. Some growers do not believe in watering the plants over the tops, and claim that to keep them dry helps in the prevention of mould. As a substitute, they provide moisture by a system of sub-surface irrigation by inserting a tin pipe, or 3-in. drain pipes, lengthwise under the centre of the bed, about 3 inches beneath the surface. The pipe is perforated the whole length, and the lower end blocked. When required, it is filled with water, which exudes through the perforations. The soil is thus moistened round the roots, while the surface leaves are kept dry. This is undoubtedly a good practice, and, once established, provides an easy way to supply water.

If the plants are not growing as fast as required, they can be assisted by applications of liquid manure, made by filling a barrel half full of well-rotted stable manure, to which water is added until the barrel is full. This should be well stirred before being sprinkled over the bed. Artificial fertilizer can be used in the same way.

Should trouble occur with insect pests, the plants may be dusted with a mixture of 1 lb. of paris green or arsenate of lead to 60 lb. of pollard or flour, and the same mixture made into a paste sweetened with coarse sugar, spread about the beds, will be found effective for killing slugs or snails. Spraying with kerosene emulsion is also a good custom to adopt for winged insect pests, such as thrips and skip jacks. While the plants are growing, weeds should be picked out and if the plants are too thickly sown they should be thinned out to allow each to grow strong and healthy. When they are not making sufficiently fast growth, their development can be hastened by watering them twice a week with a mixture consisting of 2 oz. of nitrate of soda to 10 gallons of water. It is not wise to force the plants unduly towards transplanting time. As a matter of fact, a little starving for moisture in the last week will have the effect of toughening them and making them stronger and better fitted for the change from the seed beds to the field.

When the plants have grown to a height of 4 inches to 6 inches they are ready for transplanting. It is not a good plan to plant out very small plants, as they have not so good a chance of striking well as plants 4 inches or over. At the same time, plants too large are difficult to handle, and are liable to receive a check in their growth. Provided the right precautions are taken in raising the plants, and particularly in the process of hardening before transplanting, there should be little filling-in required after the first planting out.

"SHOT-HOLE" OF APRICOTS.

(*Coryneum beijerinckii*, Oud.)

PROGRESS REPORT ON CONTROL EXPERIMENTS CARRIED OUT DURING 1926 IN THE GOULBURN VALLEY.

By S. Fish, B.Agr.Sc., Assistant Plant Pathologist, and
A. A. Hammond, Senior Orchard Supervisor.

Plate 1.—A Spray of Infected Apricots.

(Note the badly scabbed fruits and the condition of the leaves caused by *Coryneum beijerinckii*.)

Signs of the Disease.

Apricot Scab caused by the fungus (*Coryneum beijerinckii*) has been present in Victoria for many years. It attacks blossoms, twigs, leaves, and fruit. When the blossoms are affected, they shrivel and fall,

as though injured by frost. On the young wood or twigs the affected portion takes the form of depressed oval areas dark in colour; the bark ruptures, clusters of spores develop and gum often exudes. The leaf buds are killed by this fungus, and gummy buds may result. Such buds are

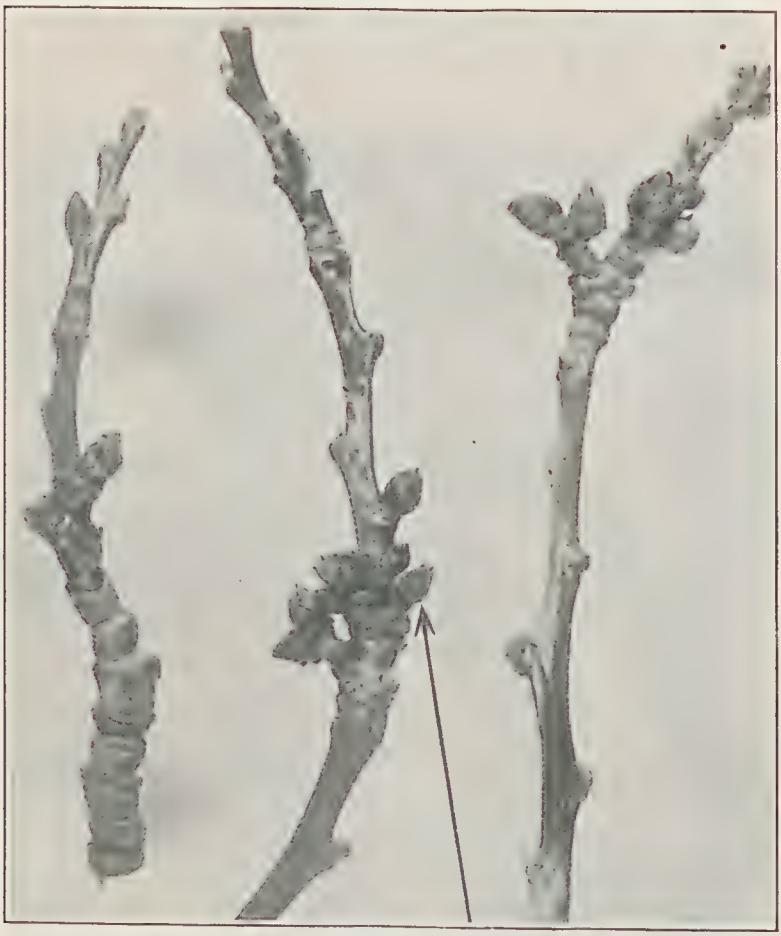


Plate 2.

The arrow indicates buds of apricots infected with the spores (or seeds) of *Coryneum beijerinckii.*

at present regarded as the principal sources of infection, because examination of many of them under the microscope showed that up to a thousand spores or seeds of the fungus were present in between the scales of a single bud. That these buds are a source of infection can be demonstrated by placing the spores or seeds in a few drops of rain water when they will readily germinate.

The first appearance of the disease on the leaves last year took the form of very small brown spots on the first leaf put out from the buds. The spores falling on the leaves germinate, the germ tube enters the leaf, and the infected cells turn brown. These areas are then cut off from the living tissue by means of a corky layer, and fall out, leaving the characteristic shot-hole appearance.

The infection of the fruit is first indicated by minute bright crimson spots, which increase in size and cause a definite scabbing on the surface of the fruit. Upon the diseased tissue, spores are produced in masses, and these falling from the fruit and leaves are scattered on to the buds and wood. There the spores germinate, and produce mycelium, which penetrates and kills the bud as well as portions of the wood.

Plate 3.—Spores or Seeds of the fungus Coryneum beijerinckii which carries scat or shot-hole of apricots. (Enlarged 200 times.)

The Experiments and their Results.

The control experiments were designed to test the relative efficiency of the various copper sprays on the shot-hole disease, and to determine the most effective and the cheapest spray or sprays required. A further test was designed to demonstrate that lime sulphur spring sprays should not be given to apricot trees.

For the purpose of the experiments 150 trees of the Moorpark variety, thirteen years old, and grown on apricot seedling stocks, were placed under test. These were in 25 rows of six trees each.

Before considering the results, it is necessary to describe a blemish resulting from the spring spray; this spray consisted, in some cases, of half strength standard Bordeaux mixture (6.4.80), and in others of half strength Copper soda (6.8.80). The fruit on the trees receiving these spring sprays was affected with a skin blemish which was worse on the side of the fruit facing the west. This blemish did not penetrate the tissue deeply, and when the fruit swelled up, just before

harvest, it was not so marked. Such affected fruit was not suitable for canning, but was used for pulp, and as for pulping purposes its value was only £9 per ton, it meant a loss of £3 per ton.

From the commercial stand-point the most effective spray is the one which combines cheapness with effectiveness in warding off scab while not causing any blemish of the fruit. The two control rows of six trees each gave 12 per cent. of scabby fruit. Where Bordeaux

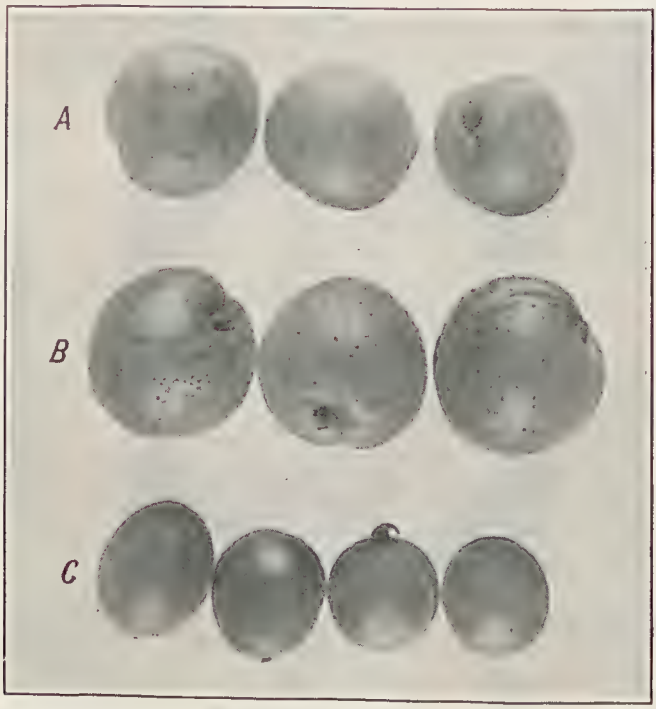


Plate 4.—Fruit from the rows that received Lime Sulphur sprays.

A.—Fruit from trees sprayed with lime sulphur (1–15) at dormant period, and with lime sulphur (1–25) at the pink bud stage. (Note the badly scabbed condition.)

B.—Fruit from row sprayed with lime sulphur (1–15). (Note the badly scabbed condition of the fruit.)

C.—Fruit from row that received lime sulphur (1–15) at the dormant period, lime sulphur (1–25) at the pink bud stage, and lime sulphur (1–40) as a spring spray. (Note the size and scurfy condition of fruit.)

mixture—6.4.40 spray—was given at the dormant stage (20th July), followed by a similar spray when the buds were showing pink, 97 per cent. of the fruit was clean and only 3 per cent. scabby.

The cost of giving one tree two sprayings with standard Bordeaux (6.4.40) was sevenpence. In arriving at this amount allowance has been made for the cost of spray material, for labour, the use of a horse, and the interest and depreciation on the pump.

Five vats of spray put out per day was taken as a measure of the amount of work performed. The large apricot trees under test required 2 gallons of spray each.

Throughout the test commercial (lime casein) spreader was used at the rate of 1 lb. per 100 gallons. The pressure pump used worked at from 180 to 200 lb. per square inch.

In order to test the effect of lime sulphur for the control of apricot scab, experiments were carried out on three rows of six trees each. These three rows were to the left of the main block and their fruit had been badly scabbed in the previous season.

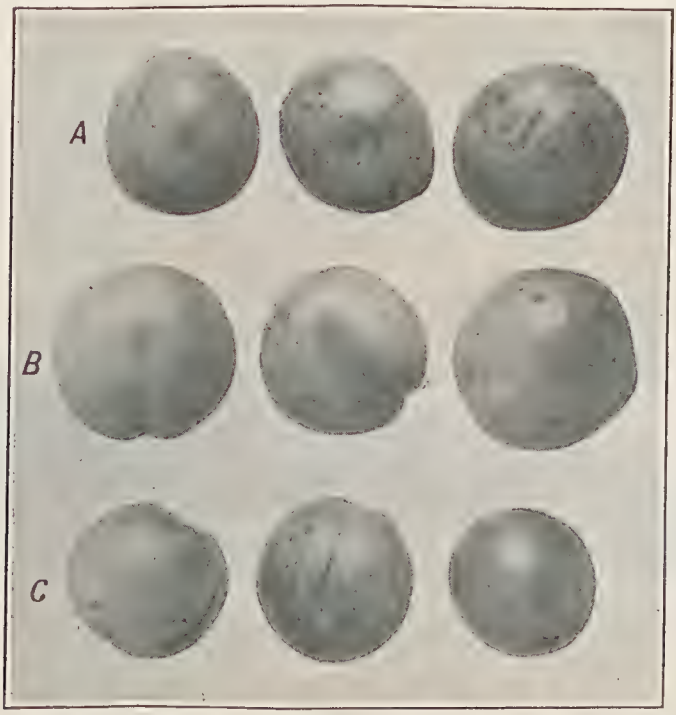


Plate 5.

A.—Typical fruit from the control rows. (Note the definite scabbing.)
B.—Typical clean fruit from the rows that received two sprayings of Bordeaux mixture (6.4.40)—one at the dormant period and one at the pink bud stage.
C.—Fruit showing the type of spray blemish caused by Bordeaux mixture (6.4.80) applied in the spring.

A single spraying of 1-15 lime sulphur of Baumé 32 deg. applied to one row when the trees were dormant (20th July) showed 60 per cent. clean and 40 per cent. scabby fruit. No evidence of spray injury was noticed.

The result of a double spraying, consisting of lime sulphur (1-15) applied at the dormant period (20th July) and lime sulphur (1-25) sprayed on at the pink bud stage, gave 71 per cent. of clean fruit and 29 per cent. scabby fruit, and still no evidence of spray injury.

Triple spraying consisting of lime sulphur (1-15) at the dormant period of the tree (20th July), lime sulphur (1-25) at the pink bud stage (5th August) and lime sulphur (1-40), as a spring spray (2nd October), gave 57 per cent. clean fruit and 43 per cent. fruit severely damaged by spray blemish. The leaves and fruit of the trees in the row which received this spring spraying were damaged. The margins of the leaves turned yellow and many leaves fell prematurely. Thirty per cent. of the fruit fell a few days after receiving this particular spraying; that remaining was stunted and scurfy, and its ripening was delayed about ten days, and even then it was undersized.

Summary.

The experiments so far indicate:—

(1) That for the profitable control of shot-hole of apricots, two sprayings of the Standard Bordeaux mixture—6.4.40—(bluestone 6 lb., quicklime 4 lb., and 40 gallons of water) one applied when the trees are dormant, and the second when the buds are showing pink, have given the best results.

Plate 6.—View of the Apricot Trees under test for the control of "Shot-Hole" Fungus at the Shepparton High School Farm.

(2) That the results from the use of Copper soda are not as satisfactory as those from Bordeaux mixture.

(3) That spraying apricots with half strength Bordeaux mixture, 6.4.80, or half strength Copper soda, 6.8.80 (6 lb. bluestone, 8 lb. of washing soda, and 80 gallons of water) in the spring is accompanied with risk, since the fruit may become spray blemished on the west side.

(4) That lime sulphur, as used in the experiments, did not effectively control the "shot-hole," and that where 1-40 lime sulphur spray of Baumé 32 deg. was applied in the spring, the leaves and fruit were damaged.

Opportunity is taken here of thanking Mr. W. Gilchrist, Manager of the High School Farm, Shepparton, and Messrs. Pilloud and Nunn, Orchard Supervisors, for active assistance in the carrying out of these tests.

BROWN ROT OF PEACHES.

By S. Fish, B.Agr.Sc., Assistant Plant Pathologist.

Brown rot is the most destructive of all diseases of the peach in Victoria. The disease was first identified in this State by McAlpine in 1902. In 1914, specimens were received from several districts south of the Divide, and an outbreak became widespread in 1918. In epidemics then and since growers have lost entire crops. The disease was not present in the Goulburn Valley peach areas until 1921, but since then it has spread throughout the district with remarkable rapidity.

This fungus* causes disease of the blossoms, twigs, leaves, and fruit. The affected blossoms turn brown and wilt, but do not fall for some time. That stage of the disease is rarely seen in the Goulburn Valley, though it is common south of the Divide. Leaf infection is very rare in Victoria, but has been observed in a few orchards in the south.

Twig infection is brought about by the mycelium or strands of the fungus passing down the fruit-stalk of the affected blossoms or through the fruit-stalk of diseased fruits, or from wounds in the bark, or through the lenticels. The greatest development of strands takes place near the cambium layer, where the mycelium or strands lie dormant until the following year. In some cases, this development of strands cuts off the sap-flow, and the parts of the tree beyond such a point die back. In other cases the strands of the fungus will work along the inside of twigs until they are 6 inches from the point of infection. Such twigs, although sometimes they may appear healthy, are, in reality, diseased.

These twig infections are to be found on all infected peach trees throughout the State, and are the principal sources from which the disease is spread. When the tree bursts into blossom, or even before, tufts or strands of the fungus that have forced a passage through small cracks in the diseased bark or through lenticels appear on the surface of the diseased wood. Later, chains of conidia, or summer seeds of the fungus, form on the surface of the tufts, and continue to develop through spring and summer. These are distributed far and near by air currents. Hence hundreds of diseased twigs may serve as centres of infection. Very few orchardists have any knowledge of blossom or twig infection. The injury is usually attributed by them to frosts.

The first visible sign of the disease on the fruit is a minute brown spot. This enlarges, and the whole of the fruit may be involved in 24 hours. Conidia, or summer seeds of the fungus, appear at the centre of infection. Later, concentric rings of conidia form over the diseased area. A large proportion of the infected fruit falls, while some fruits remain as "mummies" on the tree. The over-wintering form of seed of this fungus (ascospore) has not been found in Victoria.

High humidity, caused by a drizzling rain together with warm conditions, will in 24 hours bring about suitable conditions for the growth of the fungus on the fruit.

* *Sclerotinia cinerea* (Bon.) Schrot.

Peaches from the Goulburn Valley sometimes reach the Melbourne and Sydney markets in a very bad state owing to their being infected with Brown Rot. Such fruit will be apparently sound at the time of packing, but soon afterwards the summer seeds of the fungus present on the surface of the fruit germinate and penetrate the peaches, producing fungus strands which completely spoil the fruit.

This development of the fungus on the fruit in transit is favoured by warmth and moisture.

Peaches affected with Brown Rot.

Control Methods.

The following methods of control are recommended:—

(1) Prune out all diseased twigs, as these are the principal means of carrying the disease on to the following year.

(2) Pull off the "mummies," as the fungus works from these into the wood of the tree, and is carried over to the next season.

(3) Three years' spraying experiments on the control of Brown Rot of peaches, carried out at Bairnsdale by Mr. C. C. Brittlebank, of the Science Branch, have demonstrated that the disease can be checked by the following sprays:—

(*a*) Just before the buds begin to swell—lime sulphur, 1-9 of Baumé 32.

(*b*) As the buds show pink—lime sulphur, 1-35.

(*c*) As the fruit begins to colour—lime sulphur, 1-80.

(*d*) One month to three weeks before the picking—lime sulphur, 1-100.

Experiments for the control of Brown rot of peaches in the Goulburn Valley were initiated last season. So far, lime sulphur sprayings, as carried out south of the Divide, described above, have given the most promising results.

To minimize the chances of infecting sound fruit while it is being picked and packed, those engaged in the work should be extremely careful not to touch it after handling diseased peaches without washing their hands thoroughly, as the fine grey powder on the surface of the infected fruit consists of thousands of seeds of the fungus.

The experiments conducted last season in the Goulburn Valley indicated that fruit from the multiple-lime-sulphur-sprayed trees carried far better than fruit from unsprayed trees, even though no difference between them was apparent at the time of packing.

GRUBS IN DRIED FRUITS.

STORAGE AND FUMIGATION TESTS.

By G. B. Tindale, B.Agr.Sc., Cool Storage Experimentalist, and C. French, Jun., Entomologist.

The problem of the control of "grubs" in dried fruits has of late received much attention, for on its solution the success of the industry to a large extent depends. Cleanliness at the source of production is, of course, of the greatest importance, but something more than cleanliness is required, if infestation is to be prevented while the fruit is in storage.

Some experiments of the value of Fumigation and Cool Storage were recently made at the Government Cool Stores. Twenty-four 56-lb. boxes of dried fruit were bought in the ordinary way of business. After examination for the presence of insect pests, the fruit was then treated as set out in the table below, and later a further examination was made.

The second examination was not made for a fortnight after removal from the cool store, in order that any insects which had remained dormant during storage might have a chance to develop.

Dried Fruit.	Treatment.	Place of Storage.	First Examination (prior to Treatment and Storage), second week November, 1926.	Second Examination (after Treatment and Storage), third week April, 1927.	Time of Storage.	Condition of Fruit.	Average Loss or Gain of Weight.
Sultanas ..	Fumigated HCN ..	Commercial warehouse	48 grubs, 10 other	34 grubs, 6 other	5 months	Good, but contaminated with insect excreta and webbing. Odd berries completely eaten out	Average 1 lb. loss
Currants ..	,, ..		3 ,, 166 ,,	33 ,, 7 ,,	,,		
Lexias ..	,, ..		.. ..	57 ,, 25 ,,	..		
Sultanas ..	None		68 grubs, 20 other	43 ,, 5 ,,	,,		
Currants ..	,, ...		.. 64 ,,	26 ,, 7 ,,	..		
Lexias ..	,, ...		1 ,, 3 ,,	120 ,, 22 ,,	..		
Sultanas ..	Fumigated HNC ..	Clean room, free from contamination from outside sources	5 grubs, 23 other	73 grubs, 31 other	5 months	Good, but contamination with insect excreta and webbing. Odd berries completely eaten out	Average 1½ lb. loss
Currants ..	,, ..		.. ..	1 ,, 9 ,,	,,		
Lexias ..	,, ..		1 grub, 2 other	11 ,, 20 ,,	..		
Sultanas ..	None		22 grubs, 21 ,,	88 ,, 53 ,,	..		
Currants ..	,, ...		5 ,, —	49 ,, 253 ,,	..		
Lexias ..	,, ...		— 3 ,,	12 ,, 22 ,,	..		
Sultanas ..	Fumigated HCN ..	Cool store at 34 deg. F.	31 grubs, 8 other	.. ..	5 months	Splendid condition. Very fresh looking and quite free from insect excreta and webbing	Average ½ lb. gain
Currants ..	,, ..		.. ..	.. ..	,,		
Lexias ..	,, ..		— 7 other	.. ..	..		
Sultanas ..	None		59 grubs, 15 ,,	.. ..	..		
Currants ..	,, ...		8 ,, 258 ,,	.. ..	..		
Lexias ..	,, ...		— 9 ,,	.. ..	,,		
Sultanas ..	Fumigated HCN ..	Cool store at 25 deg. F.	12 grubs, 10 other	.. ..	5 months	Splendid condition. Very fresh looking and quite free from insect excreta and webbing	Average ½ lb. loss
Currants ..	,, ..		1 ,, ..	.. ..	,,		
Lexias ..	,, ..		1 ,, ..	.. ..	,,		
Sultanas ..	None		8 ,, ..	.. ..	,,		
Currants ..	,, ...		.. ..	.. ..	,,		
Lexias ..	,, ...		2 grubs 4 other	.. ..	,,		

NOTE.—In the above examination, "grubs" refer to larvae of *Plodia interpunctella* (dried fruit moth) and *Silvanus surinamensis* (saw-toothed grain beetle), while "other" refers to *Tribolium* sp., *Carpophilus* sp., and *Anobium*. In some boxes numerous beneficial wasps (chalcids) were seen.

The Value of Fumigation.

From the experiments very interesting deductions may be made. The first concerns the efficacy of fumigation, which was carried out at the Department's fumigating plant in the usual way adopted for dried fruits. The lid of the box is removed, and the box placed in the cyanide chamber over night. Such treatment undoubtedly kills insects present at the time, but the results show that fumigation will not prevent further infestation. This latter infestation may be due to two sources:—(1) Hatching out of eggs not destroyed during the process of fumigation, and (2) further attacks by insects from outside sources.

The Value of Cold Storage.

The second deduction concerns the efficacy of cold storage as a means of preventing grub infestation in dried fruits whilst in storage. It was thought that a temperature below zero would be more effective than one about 34 deg. F. (at which temperature most fresh fruits are stored). The results from one lot stored at 34 deg. and from another lot kept at 25 deg. (at which temperature dried fruits do not freeze hard) showed that both temperatures were satisfactory. The lower temperature probably would be the better where it was desired to reduce the period of storage.

The quality of the cool stored fruit was excellent, indeed the samples looked as fresh as new season's fruit, while some boxes actually had gained in weight.

The dried fruits which had not been in cool storage were still quite good in quality, but they were not so fresh looking as those that had been stored. Their value, however, was considerably reduced, not only by the presence of "grubs," but also on account of the presence of a relatively large amount of insect excreta and webbing.

The Cost of Cool Storing.

The cost of cool storing a box of dried fruits for five months is about 1s. 9d. (1d. per week), while the cost of storing under ordinary warehouse conditions for the same time is about 3½d. (¼d. per week). Thus the cost of eradication of insect pests by cool storage methods is 1s. 5½d. per box of 56 lb., or less than one-third of a penny per lb. Thus it can be seen that cool storage offers a means of eradicating insect pests from dried fruits at a reasonable cost.

It should be remembered that under the Pure Foods Act the sale of dried fruits infested with grubs is a punishable offence, and any such fruits found in one's possession are liable to seizure.

PLANTING OUT VINES.

(By F. de Castella, Government Viticulturist.)

The time for planting vines is now at hand, whether in the commercial vineyard or in the suburban garden. The vine may be planted successfully until spring is well advanced; indeed, I have known vineyards planted at the end of October and beginning of November that have been quite successful. Where irrigation is possible, late planting is often practised, nevertheless, August is the best month to plant the vine. Earlier planting is unnecessary. It is always well to plant before the commencement of growth, which takes place at the end of August or early in September. If growth commences while the young plants are heeled in awaiting plantation, they receive a check and must make a second start. If planted in well prepared soil while still quite dormant, the first start of growth is the only start. The vine never looks back, and at the end of the first season a development is reached greater than is possible with later planting. The stronger the first year's growth the sooner will the vine come to full bearing.

Varieties to Plant.

What to plant in a commercial vineyard is, of course, determined by the kind of vine produce it is intended to turn out and the suitability of the district for that particular branch of viticulture. If Sultanas are the objective, the Sultana vine must be planted. In drying grapes the choice is practically limited to three sorts, the Sultana, the Currant, and the Gordo Blanco, the last named being the grape from which are dried both pudding and table raisins. At the present moment the Sultana is the only drying grape that yields profitable returns; but, as we now export about 80 per cent. of the Sultanas we grow, we are dependent on the London market, and any large extension of our Sultana vineyards would be ill advised.

For wine production there is a much greater range of varieties from which to choose. Here, again, the choice depends on the type of wine it is desired to make. For each type a certain number of sorts is available, each having its peculiar advantages and drawbacks under a given set of circumstances. In making a choice, quality should be the main objective. One must avoid being led away by quantity considerations. Unfortunately, these two attributes are, in a measure, antagonistic, though some vine sorts combine them to some extent.

Our recently established and growing export trade in sweet wine with Great Britain inspires the hope that we are in a fair way to fulfil our destiny as "John Bull's Vineyard," and to supply the Mother Country with the bulk of the wines, as well as dried grapes, that she needs, but cannot grow herself. Particular interest is attached now to the varieties from which Port is made. These vines have been introduced from Portugal, and show great promise under local conditions.

Nor must we forget the light table wines of Chablis and Claret types that can be produced in great perfection in many of the cooler districts

of Victoria. It is to be deplored that the output of such wines has actually declined owing to lack of appreciation by Australian consumers. For each of these varying types of wines a number of suitable vine sorts is available.

With table grapes, also, there is a wide choice—round and oval, white, red, and black, early, mid-season, and late. The number of varieties of table grapes is legion. It is to be regretted that the public is guided by appearance and especially by size of berry rather than by appreciation of the real quality of the fruit. Greater discrimination by the purchasing public would result in the recognition of the quality of several now neglected table grapes.

Varieties for Southern Districts.

In southern districts this applies particularly to the choice of sorts for the home garden. Few of the handsome grapes that were so much in evidence in shop or barrow this season thrive in the climate of Melbourne. These are more suited to the Murray than the Yarra. In our suburban gardens the Golden Chasselas is one of the best grapes to grow. Black Hamburg and Snow's Muscat Hamburg are also quite suitable, whilst Gordo Blanco will ripen in normal seasons in a warm situation with good aspect. There are numerous other suitable sorts, but, unfortunately, they are not obtainable in the trade. Such sorts as Waltham Cross, Purple Cornichon, and Ohanez are altogether out of place in the climate of Melbourne, and should never be planted.

Phylloxera Precautions.

The question of planting vines cannot be left without touching on phylloxera. In all districts into which this insect has found its way the use of phylloxera-resistant stocks is imperative. These constitute the root system on to which is grafted the fruit-bearing sort. The vineyards of north-eastern Victoria have been reconstituted, in this way, for some years, and provide abundant proof of the success of the resistant stock under Victorian conditions of soil and climate. Even in clean districts growers would be wise to establish any new vineyards on resistant roots.

A regrettable apathy exists in many quarters concerning this very real danger. There is no doubt whatever that a time must come when even our now clean areas will become infected with the dread phylloxera, existing vineyards, not on resistant stocks, succumbing slowly, as they have done elsewhere.

Meanwhile everything must be done, and is being done, to prevent, in the greatest measure possible, the spread of the insect to clean areas of the State. In this connexion I wish to give a very emphatic warning of the risk run by persons who inadvertently convey vine plants from a phylloxerated district to one that is still clean. It does not seem to be sufficiently known that to do so constitutes a breach of the Vine and Vegetation Diseases Act, punishable by very severe penalties. This Act provides that persons introducing vines from infested places outside Victoria, or from a vine disease district within the State, are liable

to a penalty of not more than £100, or to imprisonment, with or without hard labour, for a term of not more than six months.

Two vine disease districts have been proclaimed in Victoria.

The first comprises part of the county of Grant within an approximate radius of 15 miles from the town of Geelong. The second is much larger, consisting of that portion of north-central Victoria extending north and south from Echuca to Seymour and east and west from Tallangatta to the Avoca River. It is not generally known that persons removing vines from these districts to other parts of the State render themselves liable to the severe penalties mentioned.

These precautions may seem very drastic, but the introduction of phylloxera into such districts as Mildura, Swan Hill, &c., which have the good fortune to be still clean, would have such disastrous results that they are fully justified.

Phylloxera has always been introduced into clean areas through the carelessness of persons planting only an odd vine or so, brought from an infected area. Once introduced it can never be exterminated. Growers are then compelled to live with the phylloxera and in spite of it, by grafting their vines on resistant American roots. On these, a few phylloxera continue to live, but without damaging the vine. Re-planted vineyards thus retain the insect. They act as carriers; so also do vines in certain soils, where phylloxera progresses so slowly that its presence may not be suspected for a long time.

Soil Conditions.

Having decided when and what to plant, the next question is, where to plant—on what class of land and how it should be prepared.

The vine is not a greedy plant; provided the land is fairly friable and penetrable by the roots, and the drainage is satisfactory it will thrive. From stiff clay to almost pure sand is a wide range, yet on these and intermediate types we find vigorous and fruitful vines. The vine does not like "wet feet" while in its active or growing state. During winter, when it is dormant, it will stand any amount of moisture. From spring to autumn the roots must be above the water table—stagnant water is fatal to their healthy development. Should the water table rise too high, any submerged roots are useless to the plant, and soon die off.

Vines cannot thrive in close proximity to trees. This is very noticeable in vineyards where shelter trees border the roads or where the native timber on a main road has not been grubbed or ring-barked. The poor growth of the outside rows is an eloquent protest. In suburban gardens attempts are often made to grow vines near large trees, macrocarpa hedges, &c. Under such conditions success is out of the question.

Aspect is also of importance in the cooler districts. In the warmer parts of the State and on almost level land its influence is negligible, but, in the neighbourhood of Melbourne, and especially against a house, it becomes important. A wall facing the north or east is excellent. A western aspect, though not quite so good, is usually satisfactory. A southern aspect should be avoided.

Preparation of the Land.

Preparation of the land for planting should receive careful attention. Deep preliminary cultivation—in other words, sub-soiling, is essential. Vines will grow without the soil being adequately prepared, but sub-soiling always pays, even under irrigation. Where irrigation is not practised, it is absolutely necessary, especially with resistant stocks, the roots of which do not plunge so deeply into the soil as those of the European vine. Sub-soiling to a depth of 18 inches is, therefore, always advisable. The sub-soil should be stirred to this depth, but without bringing it to the surface.

Planting.

Coming to actual plantation, we are confronted by the question whether a cutting or a rootling is to be prepared. Some growers declare that the cutting, planted where it is to remain, will result in a stronger vine. True, the undisturbed root system is better constituted than that of the transplanted vine, but the difference is trifling, and the rootling will give us a vine quite good enough for all practical purposes. Unless the cutting gets an exceptionally good start, the rootling will come to bearing sooner. As the rootling is certain to grow, it is usually preferred. The younger it is the better. Transplanting old vines is seldom satisfactory. At the fourth year they are outdistanced by vines planted when only a year old.

Cuttings are best planted in August or September. From the time of their removal from the vine they must be kept fresh by completely burying them in almost dry sand in a cool place. In this condition a preparatory action goes on which facilitates striking.

Planting of rooted vines presents no great difficulty; it is carried out in much the same way as with most deciduous garden plants. The rootling must, of course, be fresh when purchased and kept so, until planted, by "heeling in" in mellow soil. The futility of planting a vine that is dead, or nearly so, is obvious, and yet it is often done.

Plant at about the depth the vine occupied in the nursery. With vines on their own roots, i.e., ungrafted, the depth is not of vital importance. The vine is not exposed to collar rot if planted too deep, as is the case with some trees.

With grafted vines or resistants intended for field grafting, the depth is important. The common mistake is to plant too deep. The graft, or the point where the graft will be executed, should be a couple of inches above soil level.

All roots except those at the base of the young plant should be cut off flush and the basal ones shortened back to about 3 inches. The top growth should be shortened back to the basal part of the strongest and best situated shoot so as to form a spur with two or three eyes, the others being cut off altogether.

Lastly, do not use manure when planting. It is quite unnecessary and will not make up in any way for insufficient preparation of the soil. Fresh stable manure is actually liable to injure the young plant—sometimes even fatally. A better root system is ensured by withholding manure of any kind when planting. The same applies to watering. Young vines which are over-irrigated are not so well constituted as those that are seldom watered.

WHEAT-GROWING IN THE MALLEE.

By H. A. Mullett, B.Ag.Sc., Superintendent of Agriculture.

Judged by standards in other parts of the world, the bulk of the land in Victoria has presented comparatively few great natural barriers to successful settlement by pioneers equipped for the most part with primitive implements and little capital. But here and there the natural obstacles have been formidable, as in the heavily-timbered parts of Gippsland and in the riverless areas in the Mallee.

There was never any doubt that Gippsland could be turned into a rich agricultural province once the timber was cleared, but the Mallee was regarded as an arid waste, little better than a desert, and hopeless for the cultivation of crops.

J. W. Beilby, a squatter who made an extended trip through the Mallee in 1840 in search of a sheep run, described it in these words: "A disgusting country throughout, and one in which it would require uncommon inducements in the way of prospective advantages to encourage any but a misanthrope to take up permanent residence." That was the general opinion held of the Mallee at that time, and one which persisted for very many years.

How subsequent events established the once despised Mallee as the granary of the State, from which, up to date, some £50,000,000 worth of wheat has been garnered, to say nothing of wool, oats, cattle, &c., is an epic story which cannot be told too often.

The district originally covered with Mallee timber comprises some 11,000,000 acres—that is to say, it amounts to nearly one-fifth of the area of the State. Conceive in the north-west corner a right-angled triangle with the 36th parallel of latitude for a base, 140 miles long, the South Australian border the perpendicular side 130 miles long, and closed to the east by the winding Murray River, and you have a rough approximation of its size, shape, and location.

It was not its dense thickets of scrub, or the absence of roads that made the district so dangerous to travellers. Rather was it the difficulty of securing supplies of fresh water. The rainfall—11 inches in the north, to 15 inches in the south—is so light and the soil for the most part so porous that there are no running streams or creeks, and the few natural water storages are mostly dry or contain salt water. The evaporation from a free water surface amounts to between 5 and 6 feet a year, so that water which happens to collect in shallow depressions and clay pans in winter soon evaporates. Even fair sized streams like the Wimmera and the Avoca succumb to seepage and evaporation, and ultimately lose themselves in a string of shallow lakes and dry waterholes in the sand.

The soil, in the main, is a porous, sandy loam, but here and there are extensive patches of white, sandy desert. Generally, the contour of the Mallee is pleasantly undulating, but there are extensive areas where fairly steep sand ridges, 50 to 70 feet high—more fertile than they appear—with flats between, occur in parallel formation like gigantic waves in a rough sea.

The prevailing timber is mallee, a stunted eucalypt, which sends up a clump of 5 or 6 stems from the root. The normal height of the

mallee is 10 to 15 feet, but species in favoured situations grow much taller. Here and there patches of Murray pine occur, especially on the more sandy land, which also grows the spiny porcupine bush, locally termed spinifex.

Very little grass grows between the mallee in its virgin state, but some grassy glades of spear and wallaby grass occur, and in the lowest depressions there are often salt flats with samphire bush, salt bush, and other similar herbage.

Summer or winter the virgin mallee scrub presents an unkempt, desolate, infertile appearance to those whose eyes are used to moister climates. Without demonstration, no one would realize that the dry, desiccated sandy soil is wonderfully fertile; that it lends itself to the scientific conservation of moisture by fallowing; that it responds wonderfully to phosphatic manures, and that an inch of rain in the Mallee goes as far as 1½ inches in most other districts.

A Mallee Roller.

Even the despised scrub has a subtle beauty all its own, as Hampel, the Mallee artist, has depicted so successfully.

As elsewhere throughout the State, the squatter preceded the farmer. The land along the rivers and inland lakes, and along the Murray frontage, was taken up first in big holdings leased from the Crown. Then the rest of the area was gradually stocked, but drought eventually drove most of the squatters in the interior out.

A few settlers on the fringe country had been nibbling at the Mallee and were pleased with its productivity; but the way was not paved for extensive settlement until the invention, in 1876, by Smith Bros., of York Peninsula, South Australia, of the stump-jump plough, and of the mallee roller by persons unknown.

The successful settlement of Mallee land in South Australia led the Government here, and also some private owners, including Mr. E. H. Lascelles, "the father of the Mallee," to subdivide large estates.

Agricultural occupation began seriously in 1889, and by 1898 nearly 4,000,000 acres, comprising the whole of the land fringing the Wimmera, Richardson, and Avoca rivers, was taken up. Extensive Government water schemes supplied the necessary water, and gradually made the area safe.

In 1908 a start was made to throw open the interior belt at three points—Murrayville, Ouyen, and north of Lake Tyrrell. Ahead of the settler railway lines were constructed, roads were located, grubbed, metalled with limestone rubble in bad places, and a series of Government tanks and bores, preliminary to a gravitation system, was laid down.

This country had reverted to the Crown, but Kow Plains Station had held out till 1899. Subsequently all the land between Ouyen and Murrayville was quite uninhabited until 1909. Then came the sturdy pioneer, equipped with his mallee roller and stump-jump implements.

Scientific Methods Triumph.

Where unorganized sheep pasturing failed, scientific wheat-farming has triumphed. There is something which grips the imagination in the conversion by a handful of pioneers of an unprofitable wilderness into a rich wheat province. It is surely an unparalled feat for the settlers in this new district, opened up in 1909, to have, at the end of eleven years' settlement, in a single season raised 450,000 acres of wheat, worth approximately £2,000,000.

In 1919 the settlement of roughly 1,300,000 acres along the Murray frontage was begun. This area has the lightest rainfall—11 to 12 inches, but contains some of the best land. Railways have been extended and new spur lines laid down, and water schemes and roads constructed for the convenience of the settlers, mainly returned soldiers. In this manner the greater bulk of the 11,000,000 acres have now been settled, so that, allowing for unsuitable lands, the end is in sight.

Most of the settlers have been successful, and some have amassed considerable wealth. But those who took up land during the past few years have had to face dry seasons, while still poorly equipped to meet them. Most are struggling to make ends meet; but a run of good seasons during the next few years, and the employment of up-to-date farming methods, will see most of them on a sound footing.

Settlers who have conquered the Mallee in the past have not averaged more than a few hundred pounds capital each. How, then, can they successfully handle 600 to 800 acres of land, clear it for the plough, provide plant and machinery, sink dams, erect houses, purchase stock, and sow crops, pay interest bills, and feed and clothe themselves meanwhile? The answer is that there is no part of the State where a good day's work for man and horses is so reproductive as in the Mallee, and there is no place where such long terms of credit, both private and public, prevail.

Most of the mallee scrub can be cleared by rolling it down with an old boiler drawn by bullocks. Trees taller than 15 feet have to be nicked with an axe before the roller. Pine trees and "bull" mallee have to be "mullenized"; that is, chopped off level with the ground. Rolling is best done between August and October. A fire stick is applied in March, and the rolled timber burned. The dry mallee burns like

tinder, and usually there are but few charred sticks to be picked up, though a bad burn may give extra trouble in this respect.

The settler lets the contract for rolling at from 4s. to 8s. 6d. per acre. The rest of the work he does himself, or, perhaps, with the assistance of a hired man. Often the seed may be drilled on to the loose soil during the first year without any further preparation whatever. In heavy soils ploughing, skim-ploughing, or discing is required. It is most important that the soil should not be ploughed deeper than 3 inches or so.

Costly improvements are unnecessary. Fencing, consisting of belar or pine spars, with a single barbed wire stretched between, the settler himself builds; likewise the erection of farm buildings, with pine poles

Harvesting an Oat Crop at Ouyen.

cut locally. Every minute of his time he can employ in work which will yield hard cash after harvest or which is a valuable permanent improvement. Soon half a dozen head of cattle and a few hundred of poultry can be maintained at little or no cost. Their returns offset the grocer's bill, and often leave something over. Tradesmen stand him credit until after harvest.

The wheat should be sown after the break of the season in April. From 45 to 50 lb. of seed per acre is sufficient for new land, and if possible up to 60 lb. of superphosphate should be drilled in as well.

It was at one time supposed that new land was so rich in ashes that the use of superphosphate would "burn off" the crop, which would be too rank when the hot weather came. That this is a fallacy has been proved repeatedly, and the evidence of exact tests conducted by the Department of Agriculture shows that 60 lb. per acre gives the best profit for wheat on new land. Even heavier dressings than that do not burn off the crop; but as they give no further increased yield they do not pay.

It is of the utmost importance to grow tall, thick stubble, so that it will carry a good fire to scorch suckers from the mallee roots. For this reason, a tall wheat of good stooling capacity should be chosen. Rajah, Mac's White, Yandilla King, Currawa, and Gluyas are acceptable varieties. A start should be made with Yandilla King first, followed by Currawa. Later Mac's White, Gluyas, or Rajah could be sown. Three varieties are quite sufficient.

The wheat crop will probably be sown on the same land for several years in succession. Any mallee shoots that appear should be slashed, and as many as possible burnt with the stubble.

As soon as possible, however, the settler should endeavour to set aside a paddock of fallow. When he can do this he can regard a reasonable yield as assured, despite a dry season. Stubble land which cannot be sown by mid June is usually better left as fallow than sown so late. The object of the fallow is to catch the winter and spring rains and conserve them for the benefit of the crop the following year. It is possible, by fallowing, to carry forward an extra 3 to 4 inches of rain this way, thus a rainfall of 12 inches becomes equal to 15 or 16 inches.

Wheat likes a firm, consolidated seed bed, hence it is necessary to plough shallowly—no deeper than 3½ inches. Later this should be worked over with a harrow and spring-toothed cultivator, as required, to preserve a loose dust mulch on the surface. This should be surface cultivation only. It is undesirable to go below a depth of, say, 2 inches. The aim should be to firm up the soil below that depth. The levers of the spring-tooth should be carefully regulated, lifted out in a loose, sandy patch, and let in in a hard patch. Should weeds such as paddy melons appear in the summer, they should be killed while quite small. To use a disc cultivator at this time of the year is generally to detrimentally affect the crop later on.

The best sowing month is May, and, if possible, the seed should be sown on a moist seed bed which will give an immediate germination. Having stored a liberal supply of moisture in the soil, it is now possible to grow more plants to the acre than on stubble land. The quantity of seed sown now should be increased to 60 lb. for early sowing, and even to 70 lb. for late sowing, or where the land is likely to be dirty with weeds. The extra wheat will tend to choke the weeds. The quantity of superphosphate can be raised with profit to 90 lb. an acre. But it should be remembered that it is undesirable to use so much on poor fallow or stubbles. You cannot make up for bad workmanship by extra superphosphate.

If diseases like take-all and flag smut are to be kept in check, oats should be grown as a rotation crop. It pays to sow oats on land being spelled in grass. Profitable grazing for the sheep is thus assured. The use of oats helps to starve out these diseases, which can only live on a host plant such as wheat or barley grass.

Finally, it may be pointed out that, during the past twenty years, the average wheat yield on each acre sown in the Mallee has been raised from 3.6 bushels an acre to 10.6 bushels an acre—an increase of about 200 per cent., and at the average rate of one-third of a bushel per annum. There is no reason whatever why this increase cannot be maintained, and even accelerated, until the average for the Mallee is

at least 15 bushels an acre. The yield of wheat in the Wimmera is advancing at the rate of three-quarters of a bushel per acre per annum —more than double the rate in the Mallee.

It ought to be the aim of every Mallee settler to help to boost his yield forward at least as fast as that in the Wimmera. The way to do it is for every man to practise these six cardinal principles of wheat-growing—

1. Fallow early.
2. Till the fallow scientifically.
3. Sow only prolific, pedigreed, pickled seed.
4. Liberally manure the crop.
5. Practise rotation of crops.
6. Keep some sheep.

"TAKE-ALL" IN WHEAT

Field Observations at Murrayville.

By S. Fish, B.Ag.Sc., Assistant Plant Pathologist.

Last season wheat crops in the Murrayville district suffered heavily from "Take-all." The disease was general throughout the district, and it was estimated that as a direct result of its attacks, crop yields were reduced by from 5 per cent. in some cases to 60 per cent. in others.

During an inspection just prior to harvest, affected patches were seen where the plants had assumed a sickly yellow appearance, and in many instances had died. This, the early stage of the disease, is generally recognized by the farmer as "Take-all." The presence of a later form, not always recognized as "Take-all," but referred to generally as "Dead heads," was seen in some plants, the heads of which were empty or contained only shrivelled grain. This form, which is equally typical of "Take-all," was present to a large extent in the Murrayville district.

Instead of the usual long fibrous roots, all affected plants examined had short, woolly roots at the base of the stem, the "wooliness" being due to the abnormal number of root hairs. These woolly roots had not penetrated the soil more than 1 to 1½ inches, whereas the usual fibrous roots can penetrate to a considerable distance in their search for moisture. With the dry conditions that existed towards the end of last year, there was, apparently, not sufficient moisture in the immediate surface of the soil to allow affected plants to reach maturity —hence the white heads and shrivelled grain. In many wheat fields "White heads" were found scattered throughout the crop. On examining the roots of some plants producing healthy heads it was found that, although a portion of the fibrous roots had been destroyed and "woolly" stumps produced, apparently sufficient fibrous roots were left to allow the plants to maintain themselves and mature their grain.

All of the many diseased specimens examined showed the presence of either the true "Take-all" fungus (*Ophiobolus graminis*) or the fungus *Wojnowicia graminis**; in some cases both fungi were present.

* *Hendersonia graminis* McAlp.

Resistant Varieties.

The following wheat varieties were found to be affected:—Gluyas, Marshall's No. 8, Federation, Major, Rajah, Improved Gluyas, Dollar, Currawa, Yandilla King, Ford, Warden, and Ranee. It was not possible to determine any difference of resistance to "Take-all" between these varieties. On many occasions affected patches were seen in which one or two normal plants existed. In some cases the roots of these plants would be healthy and in other cases diseased. Selections of wheat plants with normal roots were obtained from these "Take-all" patches. By subjecting the plants obtained from the seed of these selections to conditions favorable to the development of the disease it may be possible to raise resistant strains of some of our commercial varieties.

Influence of the Soil on the Severity of "Take-all."

It was found that infection was greater on the Mallee grey soils than on the Mallee red soils. The lime content (CaO) of the grey soils ranged from 1.986 to 2.816; that of the red soils ranged from .138 to .162 (parts per hundred). The phosphoric acid content (P_2O_5) was approximately similar on both the grey and the red soils, an average content being .056 (parts per hundred).

Cultural Operations in Relation to "Take-all."

Ten farms were visited as representative of affected crops. On one farm it was noticed that part of a crop of Gluyas growing on a swampy patch stood out against the rest of the crop in having perfectly normal heads. On examining this section of the crop, it was found that only short stumpy roots were present. The soil in which it was growing was damper than the rest of the field owing to its low-lying situation, hence sufficient moisture was apparently obtained through the short roots to mature the grain. One crop was found that showed no signs of the disease as far as the heads of wheat plants were concerned, but the "woolly roots" were present. This property had suffered severely in previous years from "Take-all," but since the adoption of the Wimmera rotation, i.e., wheat, oats, pasture, and long well-worked bare fallow, the whitehead condition of this disease had not been present. The fallow on which this particular crop was grown was awarded first place in the Murrayville fallow competition. According to the judge's report, "there was a light mulch, and moisture content was very good. No weeds were present, as a well prepared seed bed had been obtained." This fallow was Wimmera scarified to 2½ inches in February, harrowed in March, scarified in June, and again harrowed in August. It was scarified and harrowed in September, harrowed in October, and finally scarified and harrowed in November.

After harvest it was given a scarifying by means of a combine, harrowed, then combined in and harrowed. This fallowing lasted fifteen months, and it was claimed that the last two workings with the combine did not open the surface up very much; hence less blowing of the fallows resulted than where cultivators were used.

Federation and Rajah wheats sown on this fallow yielded 24 bushels and 27 bushels respectively, although the crops were damaged by a severe storm, thus it is amply demonstrated that with proper treatment Federation is in no way unsuitable for the Murrayville district, notwithstanding that the crops of this variety on all the other farms visited were severely affected with "Take-all."

Most of the infected crops were grown on land that had been ploughed up in June, and which had received few cultivations. Such methods in some years may give a reasonable yield, particularly if the rainfall during the vital period of the year be normal.

In such years as 1926, where the rainfall was insufficient at the critical period, then the late symptoms of the disease could be seen.

The rainfall at Murrayville last year was 12.38 inches compared with an average over the past fifteen years of 13.48 inches. However, its distribution was somewhat abnormal, as is shown in the following table:—

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total Points.
Average rainfall over fifteen years ...	38	133	66	44	158	155	114	159	185	102	104	90	1,348
Rainfall for 1926	4	14	66	186	258	116	109	161	170	101	14	39	1,238

From the end of October to December drying winds were very frequent.

Crops following grass were badly affected with "Take-all." Barley grass (*Hordeum murinum*) and Silver grass (*Festuca bromoides*) were found to be affected by the true "Take-all" fungus (*Ophiobolus graminis*). It was evident from a comparison of crops on burnt and unburnt land that burning the stubble is beneficial.

Summary.

The investigation indicated that the liability of a recurrence of "Take-all" would be minimized if—

1. The stubbles be burnt.
2. Fallowing be done early.
3. The fallow be kept clean, especially from barley grass and silver grass.

In the cases investigated it was found that the early and late symptoms of the disease were least pronounced in crops grown where a sound rotation system was followed, and where efficient fallowing methods were adopted.

CORRECTION.

In the *Journal* for June, page 380, line 36, the word "zoospores" should have read "oospore."

FALLOW COMPETITION.

Ultima Branch, Better Farming Association.

Report of the Judge, R. G. Thomas, M.Ag.Sc., Inspector of Agriculture.

A total of 51 entries was received for the three fallow competitions conducted by the Ultima Branch of the Better Farming Association. The competitions constitute the first section of the Crop and Fallow competitions for the Ultima, Patterson, and Draper Cups, the final award for which will be made after inspection of the crops grown on the fallows now judged. The present competitions are for one year only, the cups becoming the property of those securing the highest aggregate for fallow and crop sections in the several competitions.

Farmers in the district recognize that thorough preparation of the fallows is essential for successful crop production. This fact was reflected in the very satisfactory condition of most of the fallows exhibited. Indeed, their condition, in view of the particularly dry period and severe windstorms that preceded the judging, was a tribute to the care and skill that had been exercised in their preparation.

The fact that many of the leading exhibits were "summer" fallow shows the increasing popularity of this method of cultivation, and should prove an incentive to those who have not adopted the method to give it a trial on some portion of their cultivated land. Apart from the fact that experience has shown that summer fallow generally produces rather more wheat per acre than does winter fallow, the system has economic advantages. The initial working is given during late summer or autumn when other work is not pressing; in fact, teams can be occupied that otherwise often would be idle. Later in the year, after seeding, the land can be worked over more rapidly than could be done in the case of winter fallow, and it is then in better order than land just ploughed. The farmer is thus able to have his land in good condition before the end of winter, and then can take immediate advantage of any rains that may fall, and by lighter workings produce a mulch and conserve moisture.

The advantage in this respect is particularly noticeable when rains, after the usual winter ploughing period, are light. No opportunity is then given to kill weeds and reduce the soil to good order by late workings. It is worthy of note that, in this competition, all land summer fallowed had received a thorough winter working, and where summer fallowing had not been practised, the ploughing had been done early in the winter, and had been followed immediately by a working to reduce the land to good tilth.

The importance of this early working after winter fallow, and of a thorough winter working of summer fallow cannot be over emphasized, for the farmer in the Mallee must be prepared for seasons when the late winter and spring rains are not sufficiently heavy to permit of any but light workings. Under such conditions, a fallow that has not been well worked over while wet in the winter cannot be put into order later.

Possibly the question exercising the minds of Mallee farmers most last season was that of the prevention of drift of fallows. Windstorms were particularly severe and frequent, and took heavy toll of fallows. It is recognized that, under such conditions, the prevention of drift is most difficult, and can hardly be hoped for. It is also recognized, however, that drift can be encouraged or minimized according to the working given the land. Land left ridged by the cultivator, for instance, and preferably ridged north and south, will not drift as readily as land left flat after the harrows. Land left to dry out without working after rain will drift readily; land worked in good condition, when it retains a good tilth, will not drift so readily as land that has been worked dry and thereby reduced to a "floury" tilth. Inspection of the fallows in the district showed that no serious amount of drift had occurred in the better-worked fallows. This is an answer to the statement sometimes heard that working the land encourages drift. The fact is that it does, or does not, simply according to the state in which the land is worked. A similar opinion is often held in regard to summer fallow, and for this reason, when mixed ground is to be worked, the heavier land is often summer fallowed and the lighter and rising ground left for winter working.

ULTIMA CUP COMPETITION.

For Best 100 Acres of Fallow, 1926, and the Crop Grown on the Same Fallow, 1927. Competition Open to all Members of the Ultima Branch of the Better Farming Association.

Fallow Section.

First place is awarded to Mr. H. Booth, 97 points; second to Mr. P. Olson's No. 2 entry, 95 points, and third, Mr. H. C. Brown, 94 points.

Mr. H. Booth's fallow, a nice red loam to grey soil overlying a clay subsoil, was a particularly fine exhibit. Both subsoil and seed-bed showed a very satisfactory percentage of moisture; the mulch was in good order, and of about the right depth; no weeds were present, and the depth of cultivation was regular, giving a firm, level seed-bed. The implements had apparently been carefully driven and worked; the straight ridgings made by the spring-tooth cultivator were still visible, showing that little drift had taken place. The following cultivation had been given:—Scarified 3 inches February, scarified again June-July, spring-toothed cultivated end of July, harrowed and spring-tooth cultivated August, harrowed September, and spring-toothed cultivated October. Sheep had access to the fallow throughout the summer.

Mr. P. Olson's No. 2 fallow showed an excellent mulch, and a level well-consolidated seed-bed. The moisture content appeared to be slightly lower than that of the winning fallow, and an odd small paddy-melon was present. The land had been scarified 3 inches deep in February, scarified 2 inches in June, and harrowed immediately, and then scarified and harrowed successively in mid-June, August, September, and October. The fallow was also sheeped.

Mr. H. C. Brown's entry had been mould-board ploughed 3 inches deep early in July, and harrowed immediately, spring-tooth cultivated

end of August, harrowed and spring-toothed cultivated after rain in September, harrowed end of October. Sheep were run on the fallow.

The soil was mostly a free red loam, with some grey patches. The moisture content was satisfactory, the mulch in good order, but the seed-bed was hardly as level and uniform as in the case of the two fallows previously mentioned.

DETAILS OF AWARD—ULTIMA CUP—FALLOW SECTION.

Competitor.	Moisture.	Mulch.	Cultivation.	Absence of Weeds.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
H. Booth	24	24	24	25	97
P. Olson (No. 2 entry) ..	23	24	24	24	95
H. C. Brown	23	24	23	24	94
C. White	23	23	23	24	93
P. Olson (No. 1 entry) ..	24	23	23	23	93
W. H. Kent	23	24	22	24	93
P. J. Carroll	24	23	24	21	92
J. F. Whinfield	22	23	22	24	91
P. O'Toole	23	23	22	22	90
C. Newell	23	23	23	21	90
T. S. Fleming	22	22	23	23	90
B. Crookston	20	23	22	24	89
T. O'Brien	22	22	22	23	89
G. Young	22	22	21	24	89
Chamberlands Bros. ..	20	23	22	23	88
C. Johnson	22	21	20	24	87
T. W. Atkins	22	23	23	19	87
W. J. Reid	21	22	20	24	87
P. Sloan	21	23	22	20	86
H. F. Kelly	22	22	20	21	85
W. McGuinness	20	21	21	20	82
H. Baird	22	20	22	18	82
M. Hamilton	20	17	18	25	80
A. Johnson	18	20	19	23	80
H. C. Ferrier	15	18	21	23	77
P. J. McNamara	22	20	20	14	76
S. J. Jury	19	22	18	15	74
A. N. McKenzie	15	20	18	14	67

PATTERSON CUP COMPETITION.

FOR BEST 80 ACRES OF FALLOW, 1926, AND THE CROP GROWN ON THE SAME FALLOW IN 1927. COMPETITION OPEN TO ALL SOLDIER SETTLERS WHO ARE UNDER THE JURISDICTION OF INSPECTOR PATTERSON, OR WHO ARE MEMBERS OF THE ULTIMA BRANCH OF THE BETTER FARMING ASSOCIATION.

Fallow Section.

First place in this section is awarded to Mr. H. Brown, 94 points; equal second, Messrs. C. W. Ross, C. White, and W. H. Kent, 93 points each, and third, Mr. P. A. Wilson, 92 points.

Mr. Brown's entry has already been described in the foregoing section.

Mr. Ross's fallow was practically free of weeds and showed a nice mulch. The surface of the seed-bed was level, and consolidation fairly regular. Satisfactory moisture was present, though the fallow was not as good in this respect as some others exhibited. The land had been ploughed 3 inches deep with the undercut in February, and again with this implement early in July. It was then scarified 2 inches in August, harrowed, spring-tooth cultivated early October, harrowed after rain in November and again in December. The fallow was open to sheep.

Mr. C. White's fallow was of strong red land, most of it rather heavier and more difficult to work than the average soil of the district. It was in very good order, with a satisfactory moisture content, and a nice cloddy-ridged mulch. Practically no weeds were present; consolidation of the seed-bed was a little irregular.

Cultivation:—Mould-board ploughed 2½ inches June-July, and harrowed immediately; spring-tooth cultivated mid-August and mid-October, and part again cultivated in December. The whole was sheeped throughout.

Mr. Kent's entry was on fairly heavy Mallee land, mostly red with some grey. It had been skim-ploughed 2 inches in February, cultivated in March and in June, skim-ploughed again in June, cultivated and harrowed in August and again in January. The fallow contained satisfactory moisture and was free of weeds; the mulch was in good order, but cultivation had not been carried out so regularly as had been the case with several other exhibits.

Mr. P. A. Wilson's fallow had been mould-board ploughed 3 inches in June-July, part harrowed before ploughing completed, and all harrowed August; spring-tooth cultivated end of September and harrowed early January. Sheep were also run over it. A very nice mulch had been prepared, and the land was practically free of weeds. The seed-bed, however, was rather loose in places.

Table of Awards—Patterson Cup—Fallow Section.

Competitor.	Moisture.	Mulch.	Cultivation.	Absence of Weeds.	Total.
Possible Points	25	25	25	25	100
H. Brown	23	24	23	24	94
C. W. Ross	22	24	23	24	93
C. White	23	23	23	24	93
W. H. Kent	23	24	22	24	93
P. A. Wilson	22	24	22	24	92
J. F. Whinfield	22	23	22	24	91
T. S. Fleming	22	22	23	23	90
B. Crookston	20	23	22	24	89
M. McLeod	20	23	22	23	88
P. Sloan	21	23	22	20	86
H. C. Ferrier	15	18	21	23	77
P. J. McNamara	22	20	20	14	76
S. J. Jury	19	22	18	15	74
P. C. Bell	20	20	18	14	72

DRAPER CUP COMPETITION.

FOR BEST 80 ACRES OF FALLOW, 1926, AND THE CROP GROWN ON THE SAME FALLOW, 1927. COMPETITION OPEN TO ALL SOLDIER SETTLERS WHO ARE MEMBERS OF THE ULTIMA BRANCH, B.F.A.

Fallow Section.

First place is awarded to Mr. H. Brown, 94 points; second, Mr. C. White, and W. H. Kent, 93 points. The several entries have been commented on in previous sections.

Competitor.	Moisture.	Mulch.	Cultivation.	Absence of Weeds.	Total.
Possible Points	25	25	25	25	100
H. Brown	23	24	23	24	94
C. White	23	23	23	24	93
W. H. Kent	23	24	22	24	93
J. F. Whinfield	22	23	22	24	91
T. S. Fleming	22	22	23	23	90
P. Sloan	21	23	22	20	86
H. C. Ferrier	15	18	21	23	77
P. J. McNamara	22	20	20	14	76
S. J. Jury	19	22	18	15	74

MILK RECORDS AND THE BREEDING OF DAIRY CATTLE.

In the breeding of pedigree cattle, breed character must remain one of the primary considerations, and in the breeding of all dairy cattle, form, stamina, and constitution cannot be ignored. It happens with all breeds that some of the heaviest milkers are in themselves moderate animals judged by every standard except milk production, and it may be claimed that in the dairy herd, milk production is almost the only thing that matters. Prolonged and persistent milk production is, however, largely a matter of stamina, stamina again of conformation, and conformation of consistent breeding to one standard. A blind trust in milk records must lead quickly to degeneracy, and prove a handicap rather than assistance. Because it is the object to breed heavy yielders, it does not follow that the best results will always be obtained from breeding from those with the greatest yields to their credit.—*Farmer and Stock-breeder and Agricultural Gazette.*

POLLINATION OF FRUIT TREES.

By J. M. Ward, Superintendent of Horticulture.

All experienced orchardists know that with most trees cross- or inter-pollination is necessary for a satisfactory setting of fruit. There is, however, much to learn as to the reason why this should be so, and the subject deserves more consideration than it has so far received in Australia.

Botanically speaking, pollination is the transfer of pollen grains from the anthers to the stigma of the same flower, in which case the flower is said to be self-fertilized, or from the anthers of another flower of the same variety when it is said to be cross-pollinated. Among fruit-growers, the term is often applied in a general way to designate all the influences concerned in the setting of fruit.

For the benefit of those who are not acquainted with botany, it may be said that pollination is a function which is carried out by the "essential organs" of the flower—the stamens and pistil. The stamens bear the pollen in their anthers, and they die after the pollen is shed. The pistil consists of the ovary or seed-case, the style and the stigma. The pollen grains fall upon the stigma through the agency either of wind or insects. During a certain period the surface of the stigma is moistened by the secretion of a viscid liquid to which the pollen grains readily adhere. Pollen grains alighting on the stigma undergo a process comparable to germination, in which a slender projection from the pollen cell penetrates the stigma, and passes lengthwise through the centre of the style, and enters the ovule where fertilization occurs.

During this delicate operation, weather and other conditions must be of a favorable nature, otherwise the fertilizing processes are unsatisfactory, and a light setting of fruit results.

As stated previously, cross-pollination occurs when the stigma receives pollen from another plant of a different variety. Now orchardists, particularly apple and pear growers, realize more each year that it is essential to plant an orchard in such a way that varieties of trees will be interspersed, and so enable cross-pollination to take place.

In the early days of fruit-growing in Australia, more especially in Tasmania, when very little thought had been given to the subject of cross-pollination, varieties of apples were planted in what may be termed the block system, that is, an acre or more of one variety was planted in one block, followed with a block of another kind.

By planting on this system, many growers suffered severe losses, and for a long while they failed to find a reason for the light, irregular, or non-setting of their fruit.

The apple, Scarlet Nonpariel (better known as Scarlet Pearmain in Tasmania) is a variety that, at one period, could be depended upon to set good crops; then, for a number of years, it either failed badly,

or set crops at irregular intervals, and thus became an unprofitable apple to grow.

This variety was rarely planted on other than the block system, and was probably surrounded by such varieties as Sturmer, French Crab, Stone Pippin, Ribstone Pippin, and other old kinds, some of which, perhaps, blossomed at the same period as did the Scarlet Nonpariel, but most of them a little later; consequently cross-pollination did not take place to any extent between the Nonpariel and its neighbours. Even if one or more kinds flowered when the Scarlet Nonpariel was out in full bloom, their pollen grains would be distributed only over those trees nearest to them, and therefore the Scarlets would not be sufficiently pollenized. This is, to some extent, the reason the Scarlet has so often failed to set a good crop of fruit, for it is a well-known fact that its blossoms require to be cross-fertilized by those of another kind blooming at the same period, and one with an abundance of pollen.

Of course, it cannot be claimed that the lack of inter-pollination is the sole factor that governs the setting of fruit, nevertheless it plays a most important part. There are other factors to take into consideration; for instance, unfavorable weather conditions, such as frosts and cold winds, injury by sprays, and lack of nutriment.

Trees in poor condition bloom more profusely than those which are growing vigorously, yet their blossoms are not so capable of setting into fruit as are those of healthier and more vigorous trees.

All these matters are to be taken into account when non-setting of fruit is under consideration. However, so far as inter-pollination is concerned, it can be generally conceded that all varieties of apples, pears, and plums at least, even though the varieties may be termed self-fertile, are benefited by having other varieties planted with them as pollenizers.

By the term "self-fertile" is meant a variety whose flower is capable of setting perfect fruit without the aid of pollen grains from another variety. A self-sterile variety will not set fruit unless its blossoms receive pollen from some other variety.

One frequently meets with the term "partially self-fertile" or "partially self-sterile." By this it is meant that, under certain conditions, a limited number of fruit will set.

Most of our varieties of apples, pears, and plums can be classed in the self-sterile or partially self-sterile list; this particularly applies to such varieties of plums as Golden Drop, Angelina Burdett, to Scarlet Nonpariel, and London Pippin apples, and to the Kieffer pear. A number of other kinds could also be mentioned, but the foregoing is sufficient for the purpose.

To overcome the difficulty of lack of cross-pollination, the orchardist should plant in such a way that he will not have more than four rows of any one variety in a particular area of the orchard.

During the last apple season, so disastrous for most growers, it was very noticeable in orchards where Granny Smith and Jonathan trees had been planted side by side that they were almost the only ones to set fruit; and even the Jonathans two rows away from the Granny Smiths bore little, if any, fruit.

The season was certainly an abnormal one. From it, however, we have gained a great deal of knowledge; and those of us who did not previously believe in cross-pollination, have been taught that trees must be planted so as to allow inter-pollination to take place in a more liberal manner than in the past. To achieve this, instead of trees being planted so that five or six rows of the same variety occur together, they should be planted so that only two or three rows of the same kind are side by side.

Unfortunately, in Australia, we have made no scientific investigations into the subject of inter-pollination, and therefore have to depend upon the research made by other countries, coupled with our own observations.

Generally, we look upon the Williams bon Chretien pear as self-fertile, that is, it does not require to be planted with another variety for cross-pollination purposes. This is in the main true. It will, however, set more uniform crops over a given period of years if inter-planted with another variety blossoming at the same period. In this respect, it has been found that the blooming period of the Williams coincides very well with that of practically all other important kinds.

Popular commercial varieties that can be recommended for planting as pollenizers for the Williams are Beurre Bosc, Beurre de Anjou, Winter Nelis, and Doyenne du Comice, Winter Nelis being probably the most suitable.

Successful growers of Williams bon Chretien pears may not agree with me in recommending, or even in suggesting, the planting of another variety among the Williams. They may be perfectly satisfied with the results obtained to date, as were the growers of the Scarlet Nonpariel in Tasmania some years ago. Nevertheless, I would urge that, in any new plantations of Williams pears, growers should have a few rows of, say, Winter Nelis scattered through the orchard.

With most plants, the young fruits begin to form before fertilization takes place, though the unfertilized ovaries have but a slight hold upon life; any untoward influence, no matter how small, may cause the fruit to drop. Pollination and fertilization seem to give the tiny fruits new life, and to strengthen their attachment to the parent plant, probably because of the nourishment drawn to supply the embryo, and this may determine whether a fruit will hang on, or drop off at an early stage.

Most growers of Keiffer pears are aware that this variety is self-sterile, or partially self-sterile, and will not set a crop of fruit unless inter-pollinated with another variety, such as Beurre Clairgeau or Howell.

For the information of new growers, and others who do not understand the position, it may be well to state that pears will not pollinate apples, nor will apples pollinate pears. Also cherries, plums, apricots, and peaches will not pollinate one another.

The question then arises, "What are the essentials of a good pollenizer?" In the first place, two varieties must loom at the same time. That fact is self-evident, for if one variety is out of bloom

before the other begins, it may as well be out of the orchard, so far as cross-pollination is concerned.

A common mistake in this respect is the planting of Rome Beauty and London Pippin with such a variety as Jonathan, which finishes blooming before the blossoms of either the Rome Beauty or the London Pippin are open.

Another important matter that needs consideration is that two varieties planted for cross-pollination must have an affinity for each other, that is, the pollen of one must be acceptable to the pistils of the other, and such as will give the heaviest yield of good fruits. Both must be good pollen producers. If one be a shy bearer, and the other bloom in abundance, the variety producing little pollen will, of course, be greatly benefited, but there will be little reciprocal action.

All varieties planted for inter-pollination should be commercial kinds. This is simply a matter of economics. Careful experiments conducted in America and elsewhere have shown that very little, if any, pollen of our orchard trees, other than nut trees, is transported by the wind. Probably 99 per cent. of the transference is done by insects; the honey-bee in particular plays an important part in the matter of cross-pollination.

The Department of Agriculture has lists of the blooming dates of most of our commercial varieties of fruit trees. These lists, which are obtainable on application to the Department, would act as a guide to those intending to plant.

THE VALUE OF TOP-DRESSING.

To let his paddocks and his pastures remain in their original state means that year by year the farmer becomes bored by the dull monotony of his surroundings and by the fact that his production and profits are limited. Accordingly his occupation lacks that healthy interest which is necessary to give him pleasure. In the southern part of Victoria and in South Australia the process of top-dressing pastures has got past the experimental stage, and during recent years thousands of tons of superphosphate have been used for this purpose, demonstrating that the policy must be payable. On my own place, I have experimented with a few acres that have given satisfactory results. As a result of top-dressing with 1 cwt. of ordinary superphosphate, the clovers, which seemed to derive the greatest benefit from the manure, increased in height from 4 to 12 inches, and the mass of feed generally seemed to be three times as great. The benefit on poorer soils would be comparatively greater.—*Agricultural Gazette of New South Wales*, April, 1927.

GOVERNMENT STANDARD HERD TEST.

By A. J. Gill, Senior Herd Tester.

Herd testing is not by any means new; over 100 years ago farmers tested their cows, but testing then was a tedious process. The method was to set a quart of milk from each cow, and to skim and churn the cream it yielded, so as to ascertain the quantity of butter-fat it contained. Instead of speaking of milk testing 3 or 4 per cent., as we do now, the expression in those days was that it produced one or one-and-half ounces of butter to the quart. Though this process entailed a good deal of labour, the farmer knew that it was worth while, and that the increased gains would richly compensate him for the extra work entailed. He also knew that he could not by the eye alone detect his best cows, and that consequently he could not build up a good herd without testing. Those farmers of a hundred years ago were more progressive than 90 per cent. of our breeders are to-day.

We still have large numbers of farmers who believe that they can judge cows solely on appearance, and can tell the test of milk by its colour. It is owing to these methods of selection that we have so many herds in Victoria capable of producing very little over 100 lb. of butter-fat per cow yearly. Such herds do not pay for the grass they eat and the labour involved in milking them. Dairy farming with cows of this type, which are, unfortunately, all too common, keep the farmer verging on poverty, and with very little hope of bettering his position.

The only possible way to bring about a permanent improvement in our herds is by the introduction of a good pure-bred sire.

When we speak of scrub bulls, people usually understand that we refer to mongrel animals, but, unfortunately, there are pure-bred bulls which must be classed as scrubs, and they are as great a menace to the dairying industry as is the mongrel.

It was with the object of eliminating the pure-bred scrub and of enabling the farmers to purchase bulls capable of improving their herds that breeders of pure stock throughout the State were invited to submit their herds to the Government Standard Herd Test.

The scheme adopted was, I think one can say without boasting, the best ever introduced in any part of the world.

Charts are provided on which the breeders record the weights of milk from each cow—morning and evening. A tester pays surprise visits to the farm monthly, weighs the milk, and collects samples for testing.

The tester is not allowed to take a composite sample, that is, a sample of mixed morning's and evening's milk. This does away with the chance of error occurring by failure to take the correct amount in proportion to the weight of milk. Again, the officer is not allowed to test the milk on the farm. Each sample is placed in a rubber-stoppered bottle and forwarded to the Department of Agriculture, where it is tested by an analytical chemist, and the composite result worked out.

It may be objected that a dishonest owner, surmising the time of the tester's visits, would so arrange the hours of milking that on these

occasions the yield would not be representative of the daily returns To prevent any deception of this kind, check tests of four consecutive milkings are sometimes taken. As a further check, the testers are frequently changed.

One very important regulation, made when the Standard Herd Test was instituted, was that insisting that every cow in the herd must be tested. The object was to bring about a general herd improvement and to force out the scrubs.

Had breeders been allowed to submit only a few of their best cows, we would not have made much headway. The duffers would have remained, and their calves been sold on the performance of a distant relative. A high-producing cow may have some very poor relations. There may be great variation between two half-sisters. The introduction of an inferior sire may have made a vast difference.

The advice—Buy always direct from a tested herd; do not buy on the performance of a relative—cannot be too often or too strongly given.

The Government Herd Test is conducted for nine months only. This enables a cow to be given a spell before she calves again; such a rest is necessary for the rearing of healthy calves.

A test exceeding over twelve months is not encouraged, and where breeders have such tests made in the endeavour to obtain high records for the sake of advertisement, the cow is not in calf; consequently the test is of little value, and the result, when compared with that of the nine-months' test of a cow in calf, is altogether misleading.

Besides the actual advantage of the Government Herd Test, there is this indirect advantage—testing officers are able to give advice on feeding and in the balancing of rations, which is such an important factor.

What the Herd Test has Achieved.

The Government Standard Herd Test commenced operations in the year 1912, when the production of our dairy herds was at low ebb. The first samples were collected on the 3rd July of that year, at the farm of Mr. Gordon Lyon, Heidelberg.

The leading cow that year was "Silvermine 4th," owned by Mr. Lyon, and her record was 388 lb. of butter-fat. In 1924, a descendant of that cow gave 605 lb. of butter-fat.

Last year, the winning herd averaged 566.48 lb. of butter-fat in nine months. This year, four herds will average close on 500 lb. per cow in nine months.

The maximum average yield of our dairy cows throughout the State is 160 lb. yearly, which, expressed in money terms, is only £12. This gives some idea of the possibilities that herd testing offers the dairy farmer. The leading cow at present in this year's Government Herd Test has produced over 800 lb. of butter-fat—this means a return of £60 for butter-fat alone. Remember the butter-fat produced by the average cow in a year is worth only £12. Two cows have, so far, each given 700 lb. of butter-fat—worth £52 10s. Fifteen cows have, so far, yielded over 600 lb. of butter-fat—£40 worth for each cow. Fifty-six cows have passed the 500-lb. standard—earning £37 10s. each.

A large number of cows, including two-year-old heifers, have produced over 400 lb., thus earning £30 per head in nine months. Last year, the junior two-year-olds, that is, heifers under two years and six months old, averaged 269 lb. of butter-fat. The leading heifer gave the fine return of 515 lb. These results are exceedingly satisfactory, and, though we have in this year's test heavy yielding cows, the heifers promise to surpass their parents.

Testing has revealed the best families and the strains that possess the power of transmitting producing qualities to their offspring. The inferior ones have been discarded, and by mating bulls and cows from high-producing families, a general steady improvement has been brought about in herds competing in the test. The improvement has exceeded our expectation, and apparently we have by no means reached the limit. Two cows have yielded over 800 lb. of butter-fat in nine months, others will follow.

When the progeny from heavy milking cows are mated, the factor for heavy producing becomes intensified, and so the yields increase with each generation. In individual cases, increases up to 300 lb. have occurred in one generation. This, of course, is not common, but it shows the possibilities.

We have other cases of steady improvement in each successive generation. Here is an example—"Bluebell" produced 397 lb. of butter-fat; she was mated with a bull from a cow yielding 479 lb. Bluebell of J., from this mating, gave 437 lb., and she was mated with a bull from a cow which yielded 456 lb.; the result was "Bluebell 3rd" yielding 555 lb.; she was mated with a bull from a dam which gave 505 lb., and the cow from this mating produced 605 lb. on her second calf. The first mating resulted in an increase by the daughter over the mother's record of 40 lb., the second mating gave an increase of 118 lb., and the third 50 lb.; thus in three generations there was an improvement of 208 lb. This is a typical case, and shows how increased yields are brought about.

When bulls from such high-producing herds are introduced into our ordinary dairy herds, there must be a wonderful improvement. We shall have grade herds producing 400 and even 500 lb. of butter-fat per cow. Testing and culling and the use of good sires must eventually bring this about. I think we are not too sanguine when we say that in a few years we hope to see Victorian herds averaging, not 160 lb., but 320 lb. of butter-fat yearly—not earning their owners £12, but £24 per cow annually. We will not then hear so many complaints about the low price of butter-fat. The Government Standard Test has proved it possible, shown the way, and made the bulls available to the farmers.

Thanks are due to those breeders of pure-bred stock who tested their herds, sacrificed their inferior ones, and built up some of the high-producing families that we now have, and from which the farmer can, with confidence, choose sires for his herd.

Why Should Good Bull Calves be Slaughtered?

However, there is one point which gives cause for a good deal of anxiety. While a large number of settlers know the value and necessity for a good bull, they cannot afford to purchase one. The required

15 or 20 guineas can ill be spared, and when they reflect that three years will elapse before the sire will have any effect on the cream returns, they decide to carry on with the mongrel. One settler informed me that he had sold half of his cows in order to purchase a first class sire from tested stock. He will have a hard struggle, but he knows that if he is to make a success of dairying he must have a good bull.

It is unfortunate that financal circumstances prevent so many struggling farmers from obtaining good bulls. Owing to lack of demand, some breeders have been compelled to slaughter numbers of valuable bull calves. This year, in one herd, the bull calf from a cow which yielded 600 lb. of butter-fat, and another from a cow that gave 500 lb., were killed.

The slaughter of these calves is a serious loss to the dairying industry, and something should be done to save them. If they could be placed on farms where now scrub bulls are used, it would mean that in a few years millions of pounds would be added to the value of our produce. Settlers would like to be able to purchase these calves, and they must have them if they are to succeed.

Surely it is worth making an effort to prevent the slaughter of such animals, which, only in a few years, would mean so much added wealth, not only to the individual farmer, but also to the State.

INFECTIOUS EYE DISEASE OF STOCK.

By W. D. Shew, B.V.Sc.

This disease, known generally as Periodic or Specific Ophthalmia of animals, is very prevalent at certain times of the year in all parts of Australia.

Definition.

It may be described shortly as an infectious inflammation of the structures of the eyes of cattle, sheep, and horses, which is liable to recur, and, if neglected, may affect all contact animals. In certain cases it will cause total and permanent loss of sight.

Symptoms.

The first symptom shown by the animal is a profuse discharge of tears from one or both eyes, which are generally closed. The discharge is sometimes mixed with blood, and in a few days changes to a thick, purulent, whitish or yellowish stream, which collects in masses inside the lids, along their edges, and on the cheeks, glueing together the eye-lashes and lids.

When the lids are separated, the membranes surrounding the eye show a deep-red appearance, are covered with pus, and appear greatly

swollen and inflamed. The haw (membrana nectitans) in the inner corner of the eye is very prominent and enlarged, and projects over the eyeball.

In many cases the eye appears opaque (milky), while in some instances ulcers appear, which may cause perforation and loss of the eye. In other cases, these ulcers heal and cause scars, with contraction of the pupil and interference with the sight.

In severe cases, high fever is present, and the animal becomes very depressed, and keeps away from the others; its appetite is greatly impaired, and condition is rapidly lost.

The disease is spread by the discharge from an affected eye coming in contact with the eyes of other animals. There is no doubt that flies also carry the germ from one animal to another, and thus help to spread the complaint.

TREATMENT.

Isolate affected animals. Clean the eyes thoroughly with a warm solution of boracic acid in water, using two teaspoonfuls to a pint of water.

When the eye and surrounding skin have been thoroughly cleansed, instil, by means of an eye dropper, three or four drops of the following solution:—

Sulphate of zinc	5 grains.
Distilled water	1 ounce.

The skin below the eye down which the discharge pours must be kept well smeared with vaseline or lard to avoid scalding and loss of hair, &c. The eye drops should be repeated two or three times daily, or more often where valuable animals are concerned; whilst, with the latter, recovery will be hastened by keeping the eye covered with a shade.

This shade should be made with millinery wire, as in the crown of a woman's hat, so as to stand away from the eye and prevent rubbing. The outer edge of the shade is bent carefully to fit the shape of the head around the eye so that, fitting closely, all light and dust, &c., will be excluded. The frame should be covered with some dark-green material for preference, and if fastened securely to the headstall will be maintained firmly in place.

In very severe cases, or in cases affecting valuable animals, a veterinary surgeon should be consulted immediately, as treatment further than that described above can be carried out only under professional supervision.

If treatment is adopted in the earliest stages the eye will lose its opaque appearance and complete recovery take place; that is, if ulceration has not already occurred, in which case permanent interference with the appearance and sight of the eye may ensue.

Those cases which show signs of fever, with loss of appetite and much depression, should receive special attention. They should be well cared for, and rugged if necessary to maintain body warmth. A purgative drench should be administered, and the diet should be very light and of a laxative nature. If available, green feed is most suitable.

MECHANICAL MAIZE PICKER.

Satisfactory Tests.

The mechanical maize picker imported recently by the Department of Agriculture has given satisfactory results in the series of tests and demonstrations carried out in maize-growing districts. The machine has now been demonstrated at Lindenow, Bruthen, and Orbost on crops varying in yield from 45 to 90 bushels per acre. These demonstrations were attended by some 600 maize-growers, the great majority of whom were highly satisfied with the way in which the machine performed.

In regard to the trials the Superintendent of Agriculture, Mr. H. A. Mullett, points out that Victorian maize-growers have long felt the need for some mechanical appliance that would harvest their crops effectively and cheaply. Mechanical maize-pickers have been used successfully for years in America, but there was some doubt as to whether they would do satisfactory work under the different climatic conditions obtaining in Victoria. Owing to the limited prospective market for such a machine it was felt that this point would not be cleared up unless a machine were imported and tested by the Department.

The results of the trials, Mr. Mullett says, have been highly satisfactory to both the Department and maize-growers. Where the maize was standing up well the machine picked very cleanly. Its efficiency was not affected in any way by the height of the crop. Where the maize was lodged at right angles to the row most of the down stalks were picked up, but some of the stalks lying lengthwise in the row were missed. The husking was done cleanly, but where the cobs were on the green side a portion of the grain was marked. The proportion marked was small, and growers did not regard it as a serious fault. When the crop was quite ripe a small percentage of the grain was shelled. This grain was not lost, being delivered into the bag with the cobs.

During the demonstrations the machine was drawn by a tractor with a power "take-off," and harvested at the rate of 5 to 6 acres of maize a day. At Lindenow a five-horse team was able to draw the machine, but it was considered that horses would be of little use in the heavier crops at Bruthen and Orbost.

Following on the public demonstration at Orbost a test was made to determine the actual cost of picking maize with the machine. This test was carried out on the farm of Mr. W. Cummins on a crop of Goldmine maize estimated to yield 90 bushels per acre. The test extended over four hours, of which twenty minutes were spent in oiling and making adjustments to the machine. The actual running time was thus three and a half hours, during which 169 bags of cobs were picked and bagged.

The fuel consumption was 41 pints of kerosene and half a pint of benzine, or a total cost of 8s. 8½d. Other costs were—wages of tractor-driver at 18s. a day; three men each with horse and dray at

£1 a day each, and an extra man for bagging at 12s. a day. The total outlay was thus £2 13s. 8d., or a cost of 3¾d. per bag. Taking the effective life of the machine at eight years, with 35 working days per annum, and allowing 20 per cent. for interest and depreciation on the tractor, gives an additional cost of 17s. 6d. for interest and depreciation for the half day. This brings the total cost of picking with the machine to 5d. per bag, including liberal allowances for interest and depreciation. The cost of hand picking such a crop would be 7d. per bag.

AGRICULTURAL RESEARCH.

Empire Co-operation.

The Director of Agriculture, Dr. S. S. Cameron, accompanied by Mrs. Cameron and their daughter, left Melbourne a few weeks ago on the s.s. *Orvieto* for England. Dr. Cameron will represent Australia at the Imperial Agricultural Research Conference, which will be attended by delegates from all the Dominions, and is expected to result in a definite scheme for the organization and administration of agricultural research throughout the Empire. The aim of the conference is to obtain full co-operation and collaboration in promoting the food production resources of the Empire.

While he is in England Dr. Cameron will make an intensive study of Agricultural Research and Research Institutions in the United Kingdom. He will return through the United States of America, where the opportunity will be taken to study the latest work in tobacco growing, so that he may be able to advise as to the best method of utilizing the fund established by the Federal Government and the British-Australasian Tobacco Company for encouraging tobacco growing in Australia.

During Dr. Cameron's absence abroad, Mr. R. Crowe, Exports Superintendent, will be acting Director of Agriculture.

AIDS TO SELECTION OF RAMS.

An illustrated pamphlet, entitled "Aids to Selection of Rams," setting out the chief characteristics of the best known Australian and British breeds of sheep has just been issued by the Department for Agriculture.

Free copies are obtainable on application to the Department.

GRAPE EXPORT TRADE.

Trial Shipment to London.

A letter has been received by the Hon. the Minister of Agriculture (Mr. Slater), from the Agent-General for Victoria, London, regarding an experimental shipment of Ohanez grapes forwarded per s.s. *Mooltan* by the Department of Agriculture.

The consignment was secured from the Merbein, Woorinen, and Shepparton districts. It consisted of 60 cases and also 29 crates, each containing eight cardboard cartons. Some cases were packed in ordinary granulated cork, and others in cork sterilized by heat. The grapes packed in the cartons were wrapped in sulphite paper without the use of cork filler.

The letter states that the outturn generally showed a decided improvement on anything so far received from Australia, although there was still room for considerable improvement. It was to be noted that grapes arriving at this time of the year were to meet the requirements of the better class trade. Consequently large bunches with large berries were required.

A price list was attached, but as the whole consignment arrived in good condition there was little variation in the price in regard to the various styles of packages. The grapes forwarded in cork averaged 15s. 4d. per three-quarter bushel case, while the crates averaged 16s. 3d.

The report adds that the demand for grapes was good, and prices undoubtedly would have been higher had the parcel been larger. Further details will be received at a later date.

BREESE'S PROLIFIC POTATOES.

The potato expert (Mr. J. T. Ramsay) received recently from Tasmania three potato specimens, with a request for their identification. In regard to the top growth it was stated that the general appearance was sprawly, and the haulm was not erect. The leaves were dark green, narrow, and with a tendency to curl. The flower was white. It was suggested that the variety was a strain of Carman. The specimens were identified by Mr. Ramsay as belonging to the variety known as Breese's Prolific. The well-known Coronation is a sport of this variety by bud variation only. On account of its habit of losing the slight colouring in the eye shortly after digging Breese's Prolific is, at times, difficult to classify, but the specimens submitted had been dug very recently, and this distinctive marking was strongly in evidence. So far as is known this variety is in no way related to the Carmans, to which it is quite different in texture.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Pruning.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong. heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree. the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

Drainage.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only

surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

SPRAYING.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur, nicotine—sulphate or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray A good, vigorous, and thorough winter spraying will place a large

majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Paeonies, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces

between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Journal of Agriculture, Nov.* 1922, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results. Write to Department for leaflet on "Rearing Calves."

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Feed pigs a balanced ration in automatic feeder. Provide plenty of charcoal and bone meal. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin. This may be given in the food, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Late lambing in the wetter districts of the State should end with this month. Late lambs are usually the result of joining the rams as late as March; this should be confined to strong cross-breds and sheep with a predominance of English blood. Lambs dropped in August do well if the district be late or if there be available for them before they are weaned summer grasses and forage. In most places such feed can be grown only by means of irrigation.

In the early northern districts of the State preparation is now being made for shearing. Early shearing is advisable where it is intended to fatten quickly old ewes, early-dropped lambs and two-tooth wethers unsuitable for wool production.

The decision should now be made as to the breed and number of pure-bred rams required for the coming season. Place orders as soon as possible; breeders can then give satisfaction and allot preference to early applicants. Purchase rams from registered flock-owners. Breed and class should be given most careful consideration. Certain districts and pastures suit one breed or cross better than another. This knowledge can be gained only from the experience of others, or by trial after mature judgment by the sheep-farmer himself.

Poultry.—Yards should be turned over with a spade or fork, and sown down with rye grass, rape, or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators, disinfect; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

CULTIVATION.

Farm.—Work land where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds.

Orchard.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur or red oil spray.

Flower Garden.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

Vegetable Garden.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

Vineyard.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before middle of month, at latest. Conclude pruning and tie down rods. A deep winter ploughing is strongly recommended. This must be completed before root action starts in August. The roots may be cut with impunity whilst the vine is dormant, but to do so after root action starts, injures the vine. Preventive swabbing with acid iron sulphate solution of sultanas and other susceptible sorts, to control vine Black Spot, is emphatically urged. Though no damage was caused by this fungus last season, it showed itself in many localities. A showery spring would permit its rapid spread on untreated vines.

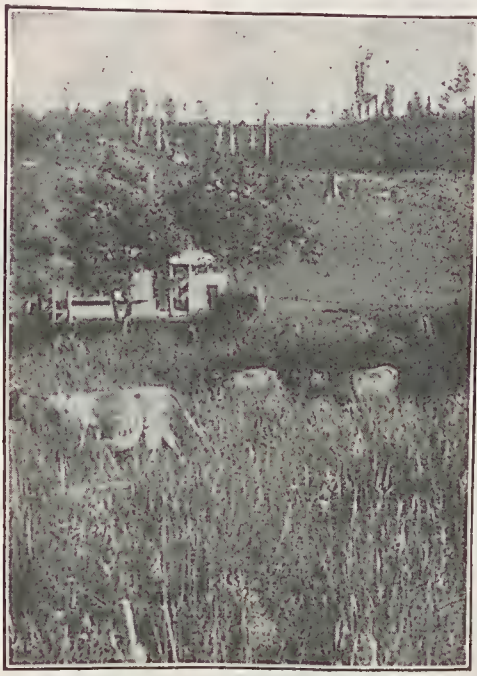
Neglect of swabbing may spell disaster. A bulletin dealing with black spot and its treatment will be supplied on application. In some districts erinose will necessitate treatment. Swabbing and also spraying with lime-sulphur (1 in 12) at the close of winter are effective against this mite.

CELLAR.—Rack again, towards end of month (spring racking), wines which have as yet only been once racked. Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

THE RURAL MIGRATION PROBLEM.

Rural migration is one of the oldest of all social phenomena, yet in the last few decades it seems to be accelerated by some special factors. The purely economic factors in this migration are so well known as to have become commonplace. They may be summarized under two main propositions. First, the demand for the great staple products of agriculture seems to have about reached the limit of expansion except as population increases. Second, the product per worker in agriculture has enormously increased, and seems likely to increase still further.—T. N. CARVER, in the *Journal of Farm Economics.*

SWAMP GRASSES



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Will convert useless swamps into valuable pasturage (worth £50 an acre). Acknowledged throughout Australia to be the finest reclaimer of Swamps, Morasses, Lagoons, Billabongs, and low banks of rivers and creeks. Poa Aquatica produces an enormous bulk of succulent feed, resembling Japanese Millet, of which all kinds of stock are exceedingly fond. Poa Aquatica is sold by roots only. Plant three bags per acre. Roots of strong, good quality,

30/- sack; ½ sack 16/-

Write for special circular

POA FLUITANS

(MANNA GRASS)

A Valuable Grass for Open Swamps

Poa Fluitans belongs to the same genus as Poa Aquatica, but is a finer and shorter grass. It grows and flourishes in open swamps, and is especially valuable when grown in conjunction with Lotus Major. It is an extremely valuable feed, and is one of the richest grasses for feeding value known. Sold in roots only (with a percentage of Lotus Major roots). Plant three bags per acre. After planting, it spreads rapidly.

Roots, 35/- sack; ½ sack 20/-

PASPALUM DISTICHUM

The ideal grass for low-lying or swampy land flooded in Winter but dry in Summer

For open swamps that dry up in summer time, Paspalum Distichum is a most valuable fodder. It can also be grown in places other than swamps, especially on sandy soil, river flat lands, and around salty marshes

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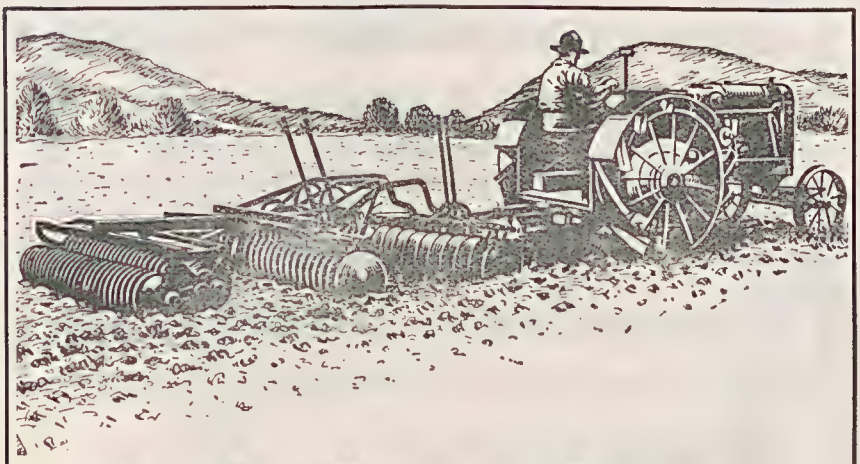

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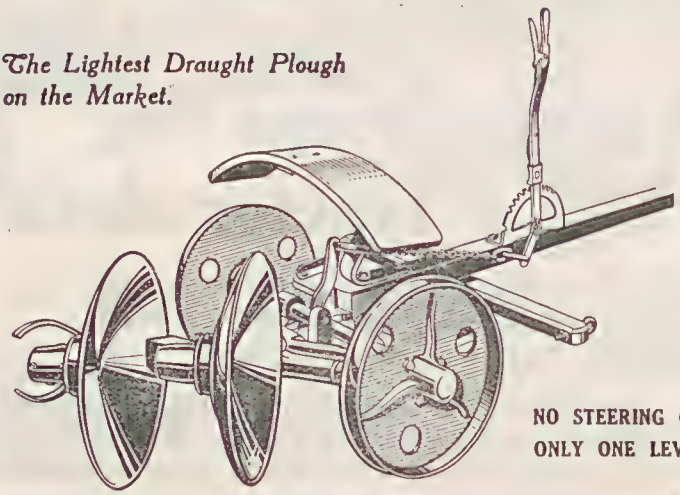

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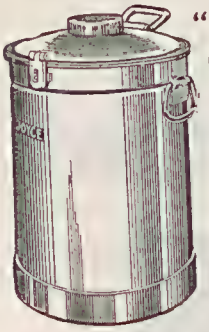

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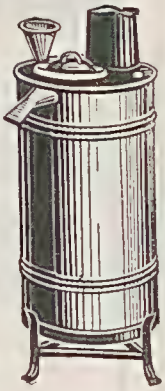

This heater is designed for use where there is no water supply from a reservoir or overhead tank. Simply pour cold water into the funnel, and it flows through the outlet steaming hot —a few chips will do it. At a recent test in the presence of Government Dairy Inspectors this heater provided 4 gallons of water at 140° by burning Saturday's *Argus*.

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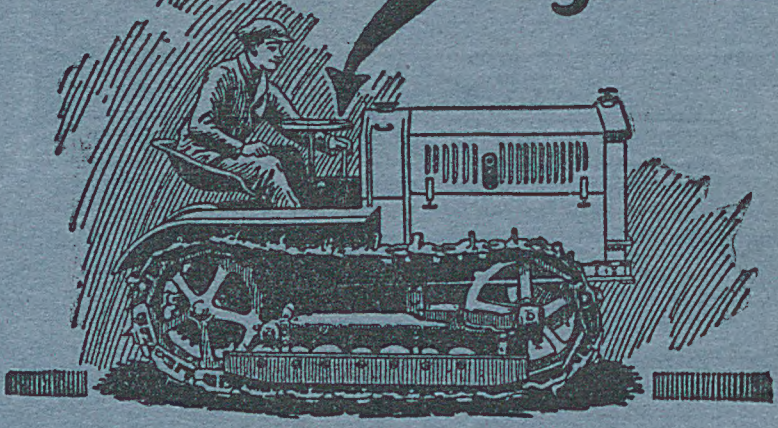

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